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Submitted to:
Massachusetts DEP

ROCCO LANDFILL INITIAL SITE ASSESSMENT

JUNE 1996

Metcalf & Eddy
An Air & Water Technologies Company

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)
LIST OF TABLES

TABLE OF CONTENTS (Continued)
LIST OF FIGURES

TABLE OF CONTENTS (Continued)
APPENDICES

EXECUTIVE SUMMARY

Metcalf & Eddy, Inc. (M&E) was retained by the Massachusetts Department of Environmental Protection (MA DEP), initially under the SARSS II program and later as a subcontractor to TRC Environmental Corporation under the SARSS III program, to perform an initial site assessment (ISA) of the Rocco Landfill in Tewksbury, Massachusetts. The assessment included a review of records, site walkover, fracture trace analysis, electromagnetic survey, monitoring well installation, sampling and analysis of groundwater, surface water, sediment and soil gas, interviews with DEP site inspectors and landfill gas emissions analyses.

The Rocco Landfill is located off the southeast side of South Street in Tewksbury (Middlesex County). The landfill parcel is over 100 acres in size. Landfilling has been conducted on approximately 41 acres of the parcel, consisting of two areas of waste disposal referred to as the "northern" and "southern" landfill lobes. Sutton Brook flows to the west between the landfill lobes and discharges off-site into the Shawsheen River. Residential areas exist west and south of the site. One residence exists on the landfill parcel. A pig farm is operated directly north of the site.

Other potential receptors in the site vicinity include Sutton Brook, the Shawsheen River, private wells located on the Rocco property and in the vicinity of the landfill, and recreational users of open space (reservation areas) near the site.

The landfill is situated within an area classified by DEP as a Potentially Productive Aquifer. Within 2,000 feet of the site are five inactive Tewksbury public water supply wells. Also, the recharge area (Zone II) for a Wilmington public drinking water supply is located approximately 0.6 miles southeast of the site, and an active public water supply well (Abbott Well) is located 3.2 miles north of the landfill.

Locally, the topography in the area is characterized as being generally flat with small hills and wetlands. The feature with the greatest relief is the landfill. Site stormwater runoff generally drains radially toward the wetland areas on all sides of the site which discharge to Sutton Brook and eventually the Shawsheen River.

Records show that the Rocco landfill began operation in 1957 as a "burning dump." It is reported that the Tewksbury Board of Health granted temporary site assignment to the facility in 1961, although the actual site assignment document was not found by M&E. The facility operated as a sanitary landfill beginning in 1961 and continued to accept municipal, commercial, and industrial wastes through 1979. In 1979, closure was ordered by the Massachusetts Department of Environmental Quality (DEQE). By that time, the elevations and limits of waste are reported to have exceeded what was shown on operational plans. Wetlands were being filled in and site slopes were steeper than operational limitations. In spite of the order, refuse was dumped at the site through the late 1980's.

An on-site loam operation which began around 1983 was halted by a Town of Tewksbury injunction prior to March 1992 due to wetlands violations. Odor complaints have been recorded by the Tewksbury Board of Health and the MA DEP from 1973 through the present.

Past studies of the site and nearby areas have included topographic and wetland mapping, sampling and analysis of area groundwater, Sutton Brook surface waters and sediment, landfill leachate, surface soils, soil gas, tap water and ambient air. A wide variety of contaminants have been detected during different sampling periods in each media. However, results have not shown drinking water, either public or private, to be affected by the landfill.

During a 1995 site inspection crevices and erosion in the cover, which allow for rain infiltration, were observed along with leachate breakouts along side slopes. These observations are consistent with DEP inspections from the 1980s. The site did not appear to be active. Liners to contain leachate or engineered covers to limit leachate formation were not apparent. The existing landfill cover cap does not meet regulatory standards regarding slopes, drainage, permeability, erosion control, gas venting and other characteristics, and is not maintained.

Based in part on results of a perimeter electromagnetic (EM) survey, ten groundwater wells were installed at the site as part of this study. Nine of these wells are located in close proximity to the landfill, and one well is located between the landfill and residential areas west of the site. Up gradient wells were not constructed because up gradient land owners would not allow such activities.

Groundwater measurements from these locations indicate shallow groundwater to the west-southwest. Bedrock groundwater was estimated to flow in a southwesterly direction.

Groundwater samples collected from these wells showed arsenic concentrations above drinking water standards in most locations. Volatile organic compounds (VOCs), including hydrocarbons and chlorinated solvents, were detected above drinking water standards at most of the nine wells next to the landfill.

All of the compounds measured in the site wells need to be compared to up gradient conditions to quantify the impact of the landfill on groundwater quality. However, it appears that the landfill is a significant source of VOC groundwater contamination.

Samples of surface water and sediment were collected from three locations on Sutton Brook. Gross measurements of contamination (i.e. indicator parameters) show surface water to be impacted by the landfill. VOCs were detected in surface water on two occasions at two locations: between the northern and southern landfill lobes and downstream of the site where Sutton Brook crosses under South Street. Arsenic was detected in surface water above drinking water standards at the South Street sampling location. Arsenic was also detected at elevated concentrations in stream sediment at these locations.

Estimates of total landfill gas emissions from the Rocco landfill show it to be below EPA thresholds which would otherwise require collection and control of landfill gas. However, there may be other reasons for collection and control of landfill gas in the future, such as gas migration, odor control or post-closure uses of the site.

Three landfill gas samples were collected and tested for VOCs. Results indicated that VOC concentrations were typical of municipal solid waste landfills.

Based on the ISA studies, additional investigations to better characterize site contamination and the potential for off-site migration of pollutants is recommended. A scope of work for a comprehensive site assessment (CSA) has been separately provided to DEP, for review and approval.

SECTION 1.1
BACKGROUND INFORMATION

1.1.1 OWNER ADDRESS

Jeanette Rocco
c/o Carol Rocco
21 Valley Road
Tewksbury, Massachusetts 01876

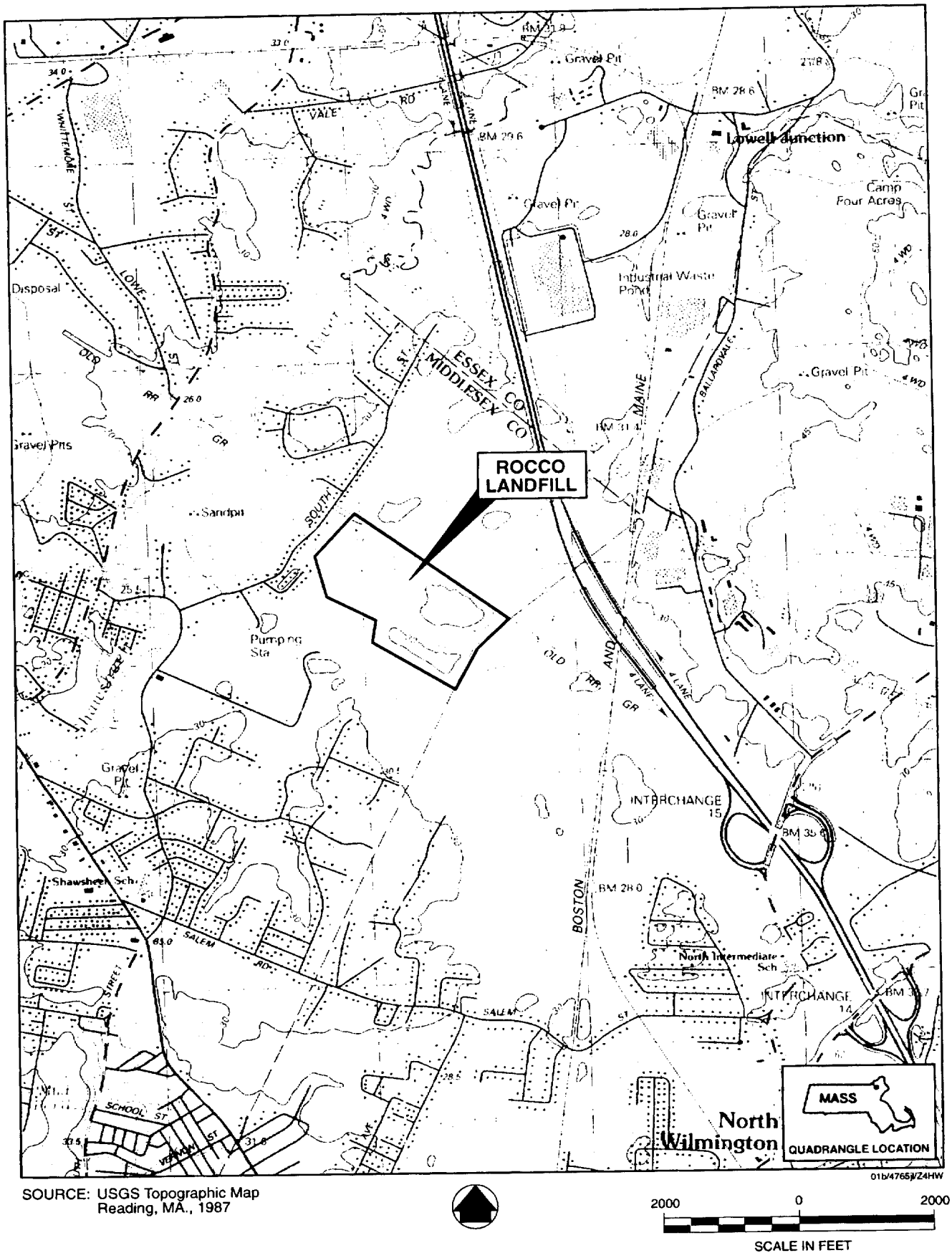
1.1.2 FACILITY ADDRESS

1069 South Street
Tewksbury, Massachusetts 01876

1.1.3 FACILITY INFORMATION

Figure 1.1-1 presents the site depicted on the U.S. Geological Survey Reading topographic quadrangle. The site is located at 42°-35'-30" N latitude and 71°-11'-00" W longitude (NUS, 1991a). The Universal Transverse Mercator (UTM) coordinates for the site are N 4,718,000 meters and E 320,900 meters. Figure 1.1-2 presents a detailed layout of the site.

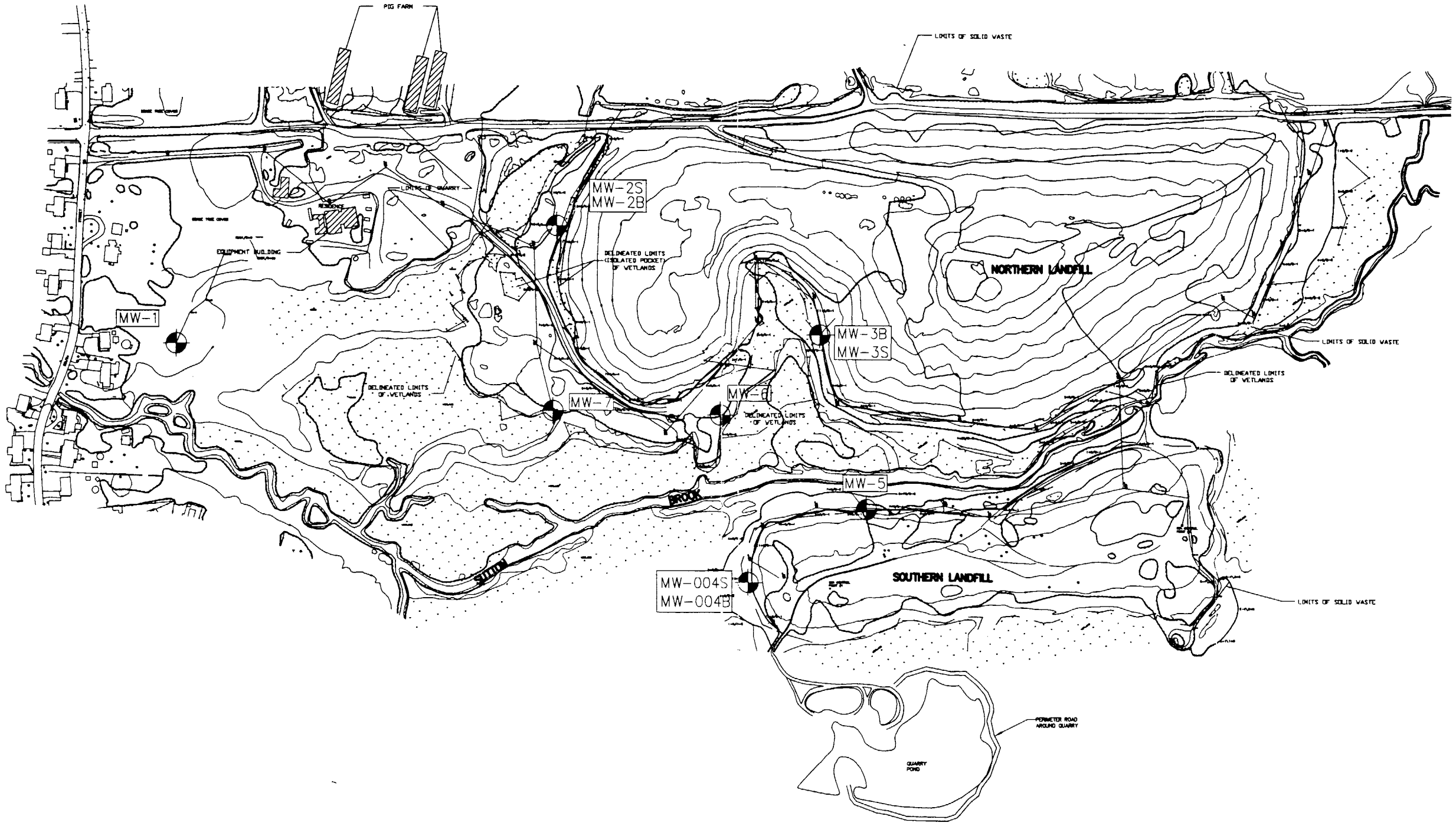
The landfill is located on a number of parcels totalling in excess of 100 acres off South Street, near the intersection of South Regina Court in the Town of Tewksbury. Sutton Brook flows through the site and divides the landfill into northern and southern portions. Landfilling has been conducted on approximately 41 acres (SEA, 1995). The Massachusetts Department of Environmental Protection (DEP) solid waste site number is SL0295.001. As there are only records referring to a temporary site assignment as a sanitary landfill, the conditions and limits of the assignment are unknown.



SOURCE: USGS Topographic Map
Reading, MA., 1987

2000 0 2000
SCALE IN FEET

FIGURE 1.1-1. SITE LOCUS MAP



REFERENCES:

BASE MAP COMPILED BY SEA ENGINEERS, MARCH 1995, FOR THE TOWN OF TEWKSBURY, MA

3 - 08-04-93

METCALF & EDDY

MA DEPARTMENT OF ENVIRONMENTAL PROTECTION
ROCCO LANDFILL INITIAL SITE ASSESSMENT

FIGURE 1.1-2
SITE LAYOUT

1.1.4 ABUTTING PROPERTY OWNERS AND LAND USES

Location	Owner	Land Use
West of Site	Various Owners	Residential Areas
North of Site	Various Owners	Piggery, Woods
East of Site	Various Owners	Partially Wooded Field
South of Site	Various Owners	Wetlands

The site is bordered to the north by an old railroad grade. Beyond that lie a piggery (Krochmal's Piggery) and wooded area. The west side is bordered by residences located along South Street and Serenity Drive. To the south, a wetlands area is utilized for ice skating in the winter. The site is bordered to the east by a partially wooded field. A wood chipping operation occurs in that area as well as pumpkin farming. Access to the site is only limited by a post and rail gate on the access road. The residence on the property is currently being leased to a tenant by the site owner.

1.1.5 GENERAL INFORMATION

The Rocco landfill began operation in 1957 as a "burning dump." The only listed operator in DEP files is Anthony Rocco. It is reported that the site was assigned as a sanitary landfill in 1961 and accepted municipal, commercial, and industrial wastes until closure was ordered by the state in 1979. After that, dumping of scrap, debris and sludges has been documented as occurring. A loaming, or soil processing, operation began around 1983. The site is not currently active and has no containment liners or engineering covers. On-site observations show that the site is utilized for hunting and/or target shooting as well as recreational biking. Steep slopes and ditches, heavy growth of tall grasses, thickets, brush, briar and pricker bushes dominate the landfill areas. Protruding metal objects have also been observed. An inactive loam operation is present near the owner's house in the northwest corner of the site (DHHS, 1992).

SECTION 1.2
HISTORICAL RESEARCH

1.2.1 WASTE DISPOSAL

Rocco's Landfill originally accepted refuse from the Town of Tewksbury. Specific waste types and amounts accepted were not fully documented in the available file information. However, there is documentation that municipal, commercial, and industrial wastes were deposited. Solvents, sanitary sewage sludge with small quantities of unknown hazardous waste, and small quantities of paint sludges and steel drum reconditioner have all been disposed of at the landfill. These paint sludges contain the compounds benzene, ethanol, ethyl acetate, methanol, methylene chloride, naphtha, polyvinyl acetate, toluene, turpentine, and aluminum (NUS, 1991b).

At the time of "closure" in 1979, the site was receiving in excess of 250 tons of refuse per day (Clougherty, 1979). In December 1980, the Town of Tewksbury was generating approximately 60 tons of refuse per day which was still sent to the landfill and the "commercial operation" of the facility received daily refuse far in excess of 40 tons per day from outside refuse disposal companies (St. Hillaire, 1980). Construction debris, scrap metal, asphalt and petroleum contaminated sludges were being brought to the site through 1988. Visual observations also reported possible waste oil dumping near the on-site garage building (Sirull, 1988).

1.2.2 PAST OPERATIONAL PROCEDURES

Rocco's Landfill was originally designated by the Tewksbury Board of Health as a temporary dumping ground. The original disposal area began at the area abutting an abandoned railroad bed at the east end of the site. In 1961, the temporary assignment of the area was modified to require that the dump be operated as a sanitary landfill, accepting only refuse generated in Tewksbury, Massachusetts. This assignment was not complied with and numerous citations were issued by the Tewksbury Board of Health between 1963 and 1979 for a variety of violations of the Massachusetts Sanitary Landfill Regulations (NUS, 1991a).

There are documented occurrences of landfill burning and uncovered areas of refuse. This was confirmed during the site walkover (see Section 1.5). Refuse was deposited at the landfill both by haulers and by residential drop-off. In 1979, the Tewksbury Board of Health voted to rescind the site assignment. On-site elevations and limits of waste exceeded what was shown on operation plans. Wetlands were filled in and slopes exceeded operational limitations (St. Hillaire, 1980). Further documentation exists recording the presence of submerged wastes (Lipman, 1995)(St. Hillaire, 1982).

Following "closure" in 1979, refuse was still brought to the site through the late 1980's. Site inspections revealed that most of the landfill was covered, but that crevices were breaking through the cover due to improper venting and cover material. Leachate breakouts were evident as well (Tuttle, 1987). Odor complaints have been recorded from 1973 through the present. The loam operations were halted by an injunction prior to March 1992 due to wetlands violations (DHHS, 1992).

1.2.3 REVIEW OF AERIAL PHOTOGRAPHS

Aerial photographs of the area were retrieved from the Massachusetts Highway Department to view the historical progress of the landfill. These photographs have been included as Figures 1.2-1 through 1.2-4.

The site appears to be undeveloped beyond the current residential area at the northwest corner of the site in the 1938 photo (Figure 1.2-1).

The 1957 photograph (Figure 1.2-2) was taken before the property was designated for disposal. The site appears to be developed for agricultural purposes in the western portion of what is now the northern landfill. Buildings which do not currently exist are also shown in this area of the photograph. All other areas of the property are heavily vegetated and undeveloped.

In the 1969 photograph (Figure 1.2-3), dumping appears to be ongoing in the eastern portion of the northern landfill, as well as in the eastern end of the southern landfill. There is a smooth area directly west of the northern landfill active area which appears to be a man-made pond full of silty water. This would be consistent with DEP reports indicating that

5098/TK

Originals in color.

FIGURE 1.2-1. ROCCO LANDFILL
AERIAL PHOTOGRAPH,
NOVEMBER 10, 1938

600 0 600

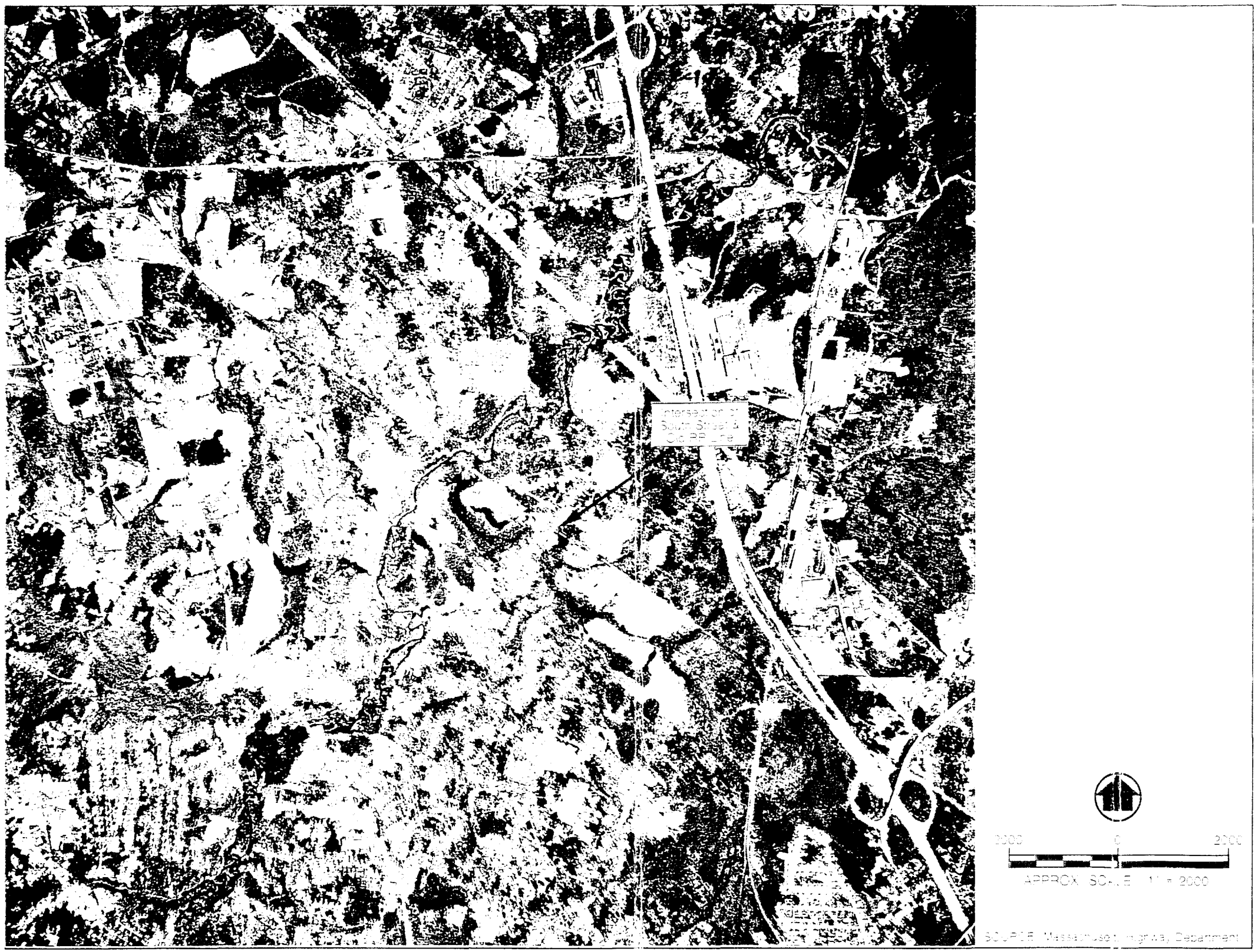
APPROX. SCALE: 1" = 600'

SOURCE: Massachusetts Highway Department

5098/TK

Originals in color.

FIGURE 1.2-2. ROCCO LANDFILL
AERIAL PHOTOGRAPH,
APRIL 3, 1957



Originals in color.

FIGURE I.2-4. ROCCO LANDFILL
AERIAL PHOTOGRAPH,
APRIL 23, 1978

SECTION 1.3
LITERATURE/DATA SEARCH

1.3.1 LIST OF ALL EXISTING REPORTS AND DATA COMPILATION

The following is a list of reports, correspondences and enforcement actions reviewed which relate to the Rocco Landfill.

May 5, 1995	Site Engineering Rocco Landfill, Prepared for the Town of Tewksbury, Massachusetts by SEA Consultants Inc.
August 20, 1993	DEP Lawrence Experiment Station, sampling results of Rocco's/Fittery Residences
October 9, 1992	Thomas McGrath, DEP, letter to Thomas Carbone, Tewksbury Board of Health summarizing results of ambient air monitoring
August 18, 1992	Barry Johnson, Assistant Surgeon General, letter to Thomas Carbone, Tewksbury Board of Health stating they will not conduct a public health assessment
April 2, 1992	Thomas Carbone, Tewksbury Board of Health, letter to Attorney Charles Zaroulis enclosing sampling results of Rocco Landfill, Loom Business, #1
March 30, 1992	Mary Ellen Stanton, United States Environmental Protection Agency (USEPA), memorandum to David McIntyre, USEPA regarding Preliminary Assessment and Site Investigation findings by Roy F. Weston in February 1992
March 25, 1992	Department of Health & Human Services, memorandum to Louise House, USEPA regarding a Health Consultation for Rocco's Landfill
March 22, 1992	Liz Callahan & Paul Giddings, DEP, memorandum to file summarizing field investigation at Rocco's Landfill between January 27 and February 12, 1992.
March 3, 1992	Thomas Carbone, Tewksbury Director of Public Health, letter to American Environmental Laboratories Inc. requesting analyses be performed on access road soil samples

February 1992	Removal Program Preliminary Assessment/Site Investigation for Rocco's Landfill Tewksbury, Massachusetts, Prepared for U.S. EPA by Roy F. Weston, Inc.
February 12, 1992	Tewksbury Director of Public Health, memorandum to Board of Health/Board of Selectmen regarding monthly progress at Rocco Landfill
February 6, 1992	Charles Zaroulis, Town Counsel, letter to David Cressman, Town Manager, regarding Capobianco loam operation at Rocco's Landfill (only page 2)
January 23, 1992	Thomas Carbone, Tewksbury Board of Health, letter to Nancy Smith, USEPA regarding data gap in NUS/FIT report dated August 15, 1991
January 21, 1992	Thomas Carbone, Tewksbury Board of Health, letter to Thomas McGrath, DEP enclosing a list of odor complaints from residents in the Rocco Landfill area
January 15, 1992	Tewksbury Director of Public Health, memorandum to Board of Health and Board of Selectmen regarding Cancer Incidence in Massachusetts from 1982-1988
January 13, 1992	Tom Carbone, Board of Health, memorandum to David Cressman regarding disposal of a boiler in the Rocco landfill
January 7, 1992	David Cressman, Town Manager, meeting notice to discuss Rocco's Landfill
January 7, 1992	Robert Williams, Dept. of Health & Human Services, letter to Thomas Carbone regarding request initiation of a public health assessment
January 3, 1992	David Cressman, Town Manager, memorandum to Charles Zaroulis, Town Counsel regarding posting of signs at Rocco's landfill
December 30, 1991	Julie Belaga, USEPA, letter to Thomas Carbone, Tewksbury Board of Health regarding proposal for Rocco's landfill being included on the NPL
December 23, 1991	Residential water sampling results collected by Thomas Carbone
December 13, 1991	Charles Zaroulis, Town Counsel, letter to Thomas Carbone, Tewksbury Board of Health regarding legal actions at Rocco's landfill

December 6, 1991	Thomas Carbone, Tewksbury Board of Health, letter to Barry Johnson, ATSDR requesting a Public Health Assessment of the neighborhood
December 4, 1991	Thomas Carbone, Tewksbury Board of Health, letter to Judy Belaga, USEPA requesting rapid scoring for determination of inclusion on the NPL
December 3, 1991	Sandra Barbeau, Board of Selectmen, letter to Louise House, ATSDR requesting a health assessment of Rocco's landfill
December 2, 1991	Julie Belaga, USEPA, letter to Senator John Kerry regarding status of EPA's investigation of the Rocco landfill
November 14, 1991	Water sample report form (no results) for residential and surface water sampling performed by Thomas Carbone
November 12, 1991	Handwritten notes apparently from Thomas Carbone, Tewksbury Board of Health, regarding file reviews
November 7, 1991	James Colman, DEP, policy providing guidance for disposal sites
September 3, 1991	Final Screening Site Inspection, Prepared for U.S. EPA by NUS Corporation
August 23, 1991	NUS Corporation, cover letters to USEPA and DEP for Final Screening Site Inspection reports
August 21, 1991	Nancy Smith, USEPA, letter to Judy Saltzman, Dept. of the Attorney General enclosing Final Site Inspection report
August 6, 1991	Lt. P.K. Gearty, memorandum regarding dumping used boilers at the Rocco landfill
June 25, 1991	Draft Screening Site Inspection Rocco's Disposal Area Tewksbury, Massachusetts, Prepared for U.S. EPA by NUS Corporation.
January 21, 1991	Lt. R. Barrelle, Tewksbury Fire Dept., memorandum to David Cressman, Board of Health regarding disposal of used furnaces and scrap metal
October 16, 1990	Thomas Carbone, Tewksbury Board of Health, letter to Charles Zaroulis regarding possible illegal dumping at Rocco's landfill

October 15, 1990	Charles Zaroulis, Town Counsel, letter to Thomas Carbone, Board of Health regarding trucks entering the Rocco site
September 20, 1990	Charles Zaroulis, Town Counsel, letter to Thomas Carbone, Board of Health regarding trucks entering the Rocco site
July 2, 1990	Thomas Carbone, Tewksbury Board of Health, notes regarding trucks entering the Rocco site
November 15, 1989	John Kelly, NUS Corporation, letter to Don Smith, USEPA regarding reconnaissance and sampling performed on October 26, 1989
October 18, 1989	Administrative Order for Access to Rocco's landfill
July 17, 1989	John Kelly, NUS Corporation, letter to W. McMenimen, Tewksbury Director of Public Health requesting air photographs for Rocco's landfill
August 15, 1988	Richard McAllister, USEPA, letter to Allen Altman regarding access to Rocco landfill
July 20, 1988	NUS Corporation work plan for Screening Site Inspection on July 27
July 14, 1988	Michael Nalipinski, USEPA, telecon with Allen Altman, who represents Jeanette Rocco, regarding access to site
July 1, 1988	Richard McAllister, USEPA, letter to Allen Altman regarding access to Rocco's landfill
June 24, 1988	Michael Montembeau, telecon with Allen Altman regarding access to Rocco's landfill
May 5, 1988	Robert Tanzer, DEQE, memorandum to Edward Kunce, DEQE, regarding options to determine if the landfill is generating odors
May 2, 1988	Naida Gavrelis, Regional Sanitarian, letter to William McMenimen, Tewksbury Board of Health regarding odors near the landfill and piggery
April 28, 1988	David Adams, DEQE, memorandum to file regarding odors near the landfill and septic pumping trucks in the area

April 20, 1988	Notes regarding telephone conversation with Susan Callahan, Krochmal's piggery, DEQE inspection at the site, and odors
April 4, 1988	DEQE Lawrence Experiment Station, results from Rocco landfill sample collected on March 10
April 1, 1988	David Adams, DEQE, affidavit in DEQE vs. Jeanette Rocco regarding his March 10 site inspection findings
March 31, 1988	Bill Strull, DEQE memorandum to file, regarding administrative search of Rocco site on March 10
March 29, 1988	David Adams, DEQE memorandum to Phil Boxell, Assistant Attorney General summarizing Rocco landfill site inspection on March 10 which included many wetlands violations
March? 1988	David Adams, DEQE memorandum to Donald Steele, AQSB-Tewksbury summarizing air monitoring performed at Rocco Landfill on March 10, 1988.
March 25, 1988	Thomas McGrath, AQSB memorandum to David Adams, DEQE summarizing air monitoring results performed at Rocco Landfill on March 10, 1988.
March 4, 1988	David Adams, DEQE, affidavit in DEQE vs. Jeanette Rocco regarding access to the landfill
February 22, 1988	James Miceli, State Representative, letter to Edward Kunce, DEQE, regarding odors emanating from the landfill
February 4, 1988	NUS Corporation Final Site Inspection Memo
January 8, 1988	Richard Chalpin, DEQE, letter to William McMenimen, Tewksbury Board of Health, regarding an inspection with an explosive meter which found nothing at the time
November 25, 1987	James Morris, Tewksbury Fire Dept., letter to Charles Coppola, Tewksbury Board of Selectmen regarding explosive meter check at the Rocco landfill
November 23, 1987	William McMellenimen, Tewksbury Board of Health, letter to Edward Kunze, DEQE, requesting an explosive meter check at the Rocco landfill

November 20, 1987	Notes regarding odor complaints in the area of Rocco's landfill and other businesses in the area
October 24, 1987	Michael Nalipinski, USEPA, telecon with Jeanette Rocco regarding access to the landfill
July 15, 1987	Court decision on DEQE vs. Rocco and Rocco vs. DEQE
June 1986	Tewksbury, Massachusetts Report on Contamination at Municipal Well Nos. 8, 9, 10, 11 and 12, Prepared by Camp Dresser & McKee Inc.
August 2, 1983	DEQE Lawrence Experiment Station, results of culvert samples near Rocco landfill collected on June 24
April 29, 1983	William St. Hilaire, Regional Environmental Engineer, testimony regarding Rocco Landfill
January 13, 1983	William St. Hilaire, DEQE, letter to Jeanette Rocco regarding wetlands act violations
September 14, 1982	DEQE Lawrence Experiment Station, results of Tewksbury water supply wells collected on August 12
August 27, 1982	DEQE Lawrence Experiment Station, results of Tewksbury water supply wells collected on August 4
August 27, 1982	Steve Medlar, Camp Dresser & McKee, meeting memorandum regarding approaches to evaluating contamination of Tewksbury's supply wells
August 27, 1982	William St. Hilaire, DEQE, letter to Alan Altman regarding necessary documentation and legal action
August 16, 1982	DEQE Lawrence Experiment Station, results of Tewksbury water supply wells collected on July 14
August 13, 1982	William St. Hilaire, DEQE, letter to James Gomes, Assistant Attorney General, regarding violations at the site
March 29, 1982	Article from The Lowell Sun regarding a fire burning in the landfill

June 9, 1981	Stephen Thomas, Browning-Ferris Industries, letter to USEPA regarding past disposal of hazardous wastes at Rocco landfill
December 3, 1980	William St. Hilaire, DEQE, letter to Malcolm Pitman, Assistant Attorney General regarding recision of a site assignment
July 31, 1980	William McMenimen, Tewksbury Board of Health, letter to Anthony Cortese, DEQE, stating a quick history on the landfill and discussing a possible inspection
June 9, 1980	Thomas McLoughlin, DEQE, letter to William McMenimen, Tewksbury Board of Health, stating that hazardous waste materials have not been sent to Rocco's Dump from Industrial Plex 128 in Woburn
December 26, 1979	Gerald McCall, DEQE, letter to Malcolm Pittman, Assistant Attorney General regarding recision of a site assignment
November 15, 1979	Rod Gaskell, Wetlands Specialist, memorandum to Malcolm Pittman, Assistant Attorney General, regarding wetlands excavation and aerial photographs showing landfill progression
October 15, 1979	Sabin Lord, Division of Water Pollution Control, letter to Gerald McCall, DEQE, regarding Sutton Brook sample collection and pollution indication
October 5, 1979	Ed Pawlowski notes relative to Rocco's Dump regarding warrant servicing
July 23, 1979	DEQE Lawrence Experiment Station, results of samples collected from Sutton Brook on 06/26/79
July 5, 1979	DEQE Lawrence Experiment Station, results of samples collected from around Sutton Brook on 06/26/79
June 14, 1979	William McMenimen, Tewksbury Board of Health, letter to Charles Lincoln, USEPA, regarding possibility of hazardous waste being disposed of at Rocco Landfill
February 21, 1979	DEQE Lawrence Experiment Station, results of samples collected from Tewksbury water supply well GP Well #11 on 02/02/79
February 16, 1979	DEQE Lawrence Experiment Station, results of samples collected from Tewksbury water supply wells on various dates

February 15, 1979	Thomas Clougherty letter to Gerald McCall regarding open burning at Rocco's landfill
October 10, 1978	Kelleher, 17 Bemis Circle, Tewksbury, letter to Thomas McLaughlin, DEQE, regarding pollution concerns
September 25, 1978	William McMenimen, Tewksbury Board of Health, memorandum to the Board of Health regarding zoning violations at Rocco's landfill
September 7, 1978	Al Nardone, DEQE, memorandum for the record regarding possible hazardous waste (plating wastes) disposal at the Tewksbury dump
May 23, 1978	Frank Gaynor, Assistant Attorney General, letter to Michael Donovan, Suffolk Superior Court, including complaint and summons
March 6, 1978	Anthony Cortese, DEQE, letter to Charles Corkin, Dept. of the Attorney General, requesting enforcement action to be taken
November 29, 1977	W. St. Hilaire, Solid Waste Disposal Inspection Report describing refuse in wetlands as well as other violations
March 16, 1977	William McMenimen, Tewksbury Board of Health, letter to Bruce Maillet, DEQE, describing the definition of each landfill area
November 29, 1976	DEQE, results of samples collected from Tewksbury monitoring well M-1-76 on 11/17/76
August 1976	DEQE, results of samples collected from Tewksbury monitoring well M-1-76 on 08/04/76
July 7, 1976	Residents of South Street Disposal Area, letter to Kenneth Tarbell regarding lack of cease and desist enforcement
June 17, 1976	Donald Martinage, Dana F. Perkins & Sons, Inc., letter to Kenneth Tarbell including two field inspection reports (March & May 1976) stating progress on operation practices
January 20, 1976	Kenneth Tarbell, DEQE, notes relative to Rocco Landfill regarding operations observed during a site visit

January 9, 1976	Kenneth Tarbell, Department of Public Health, letter to William McMenimen, Tewksbury Board of Health regarding field inspection notification and questions about site assignment
January 6, 1976	Donald Martinage, Dana F. Perkins & Sons, Inc., letter to Kenneth Tarbell including a field inspection report stating progress on construction of new disposal areas
June 27, 1975	Kenneth Tarbell, DEQE, letter to John Hawko, Dana F. Perkins & Sons, Inc. regarding a site examination for approval of an Interim Plan (continuation) for sanitary landfill operation
June 11, 1975	Kenneth Tarbell, DEQE, letter to John Hawko, Dana F. Perkins & Sons, Inc. regarding approval of an Interim Plan (continuation) for sanitary landfill operation and monthly inspections
March 27, 1975	John Sardon, Department of Public Works, letter to Tewksbury Board of Selectmen regarding poor landfill operations and rubbish in groundwater
November 11, 1974	Steven Lipman, DEQE, memorandum to Paul Anderson regarding status of Rocco Landfill operations
November 5, 1974	Fred DeFeo, DEQE, letter to John Hawko, Dana F. Perkins & Sons, Inc. regarding approval of an Interim Plan for sanitary landfill operation and monthly inspections
July 11, 1974	William Bicknell, Massachusetts Department of Public Health, letter to Tewksbury Board of Health regarding violations, including refuse placed in surface or groundwater
July 9, 1974	Mary Massinger, letter to Tewksbury Board of Health reporting burning at the Town Dump
May 7, 1974	Bruce Maillet, DEQE, letter to Anthony Rocco regarding fugitive dust emissions
November 27, 1973	Mary Massinger, letter to Tewksbury Board of Health reporting burning and odors at the Town Dump

April 11, 1966	Charles Long, Assistant Attorney General, letter to Alfred Frechette, Commissioner of Public Health, regarding opinion of the court for operating the dump by sanitary methods or to cease operation
April 15, 1965	Mass. Dept. of Public Health, letter to Edward Brooke, Attorney General regarding court decision on operating the dump as a sanitary landfill as well as status of operation
April 8, 1965	Committee on Environmental Sanitation meeting minutes regarding non-compliance with operation as a sanitary landfill
July 21, 1964	Page 2 of Board of Health meeting minutes regarding landfill burning and hours of operation
June 21, 1963	Department of Public Health, letter to Benjamin Gargill, Assistant Attorney General, regarding illegal use of the dump
June 17, 1963	Donald Pottle, notes relative to town dump, burning and dumping occurring
June 4, 1963	Herbert D. Nickerson, notes relative to town dump, burning and dumping occurring
May 24, 1963	Benjamin Gargill, Assistant Attorney General, letter to Tewksbury Board of Selectmen notifying them of action which may take place if dump operations are not corrected
May 17, 1963	Department of Public Health, letter to Edward Brooke, Attorney General, regarding request to rescind assignment of the town dumping area
February 1, 1963	E. F. M. Wong, notes relative to Tewksbury Town Dump site visit regarding fires in progress and a recommendation for dump closure
June 19, 1961	Worthen Taylor, Department of Public Health, letter to all Boards of Health regarding development of housing near old dumps
August 1, 1957	Thomas Abbott, Board of Health, meeting minutes regarding decision to begin dumping on property owned by Anthony Rocco

waste was placed below the water table at the site. The area between the 1957 developed area and the dump area of the northern landfill is still heavily vegetated. The western end of the southern landfill is also vegetated, but a road now cuts through the area. Across the railroad tracks (northeast of the northern landfill), there is an area where activity occurred, but it is not obvious whether it was only fill, excavation or some other activity.

In 1978 (Figure 1.2-4), the northern and southern landfills appear to be well-defined and roughly the same shape as today. Another cleared area is shown on the photograph to the southeast of the site, but the use of this area is not obvious.

1.3.2 INTERVIEWS

As the landfill has not been in operation for many years, site operators are no longer available for interviewing. However, Dave Adams of the DEP was interviewed and confirmed historical information in the files reviewed. Another DEP inspector, Steve Lipman, was interviewed as well. Mr. Lipman added that "substantial volumes of refuse were placed directly into groundwater and wetlands," and that there were complaints for residences regarding rodents in addition to the odors in the area.

1.3.3 REVIEW OF USGS DATA

Documents which were reviewed for the Initial Site Assessment Report include the USGS topographic map for the Reading quadrangle as well as surficial geologic maps of the Wilmington, Massachusetts quadrangle and a bedrock geologic map of the Commonwealth of Massachusetts.

Locally, the topography in the area is characterized as being generally flat with small hills and wetlands. The features with the largest relief are the landfilled hills. The surficial runoff generally drains toward the wetland areas on all sides of the site which discharge into Sutton Brook and eventually into the Shawsheen River.

Additional information on the regional and site geology and hydrogeology is provided in Section 1.4.

1.3.4 POTENTIAL ENVIRONMENTAL AND PUBLIC HEALTH SENSITIVE RECEPTORS NEAR THE LANDFILL

The Rocco Landfill is in an Interim Wellhead Protection Zone for a set of five public overburden supply wells to the south/southeast. These wells are presented in Figure 1.6-2. In the past, these wells have been studied and found to be contaminated with bacteria, metals and 1,1,1-trichloroethane. All have been removed from service. Two of these wells were considered emergency backup wells until approximately 1992 when the power to the wells was cut to appease area residents. (Carbone, 1996) However, a 1986 study by Camp

Dresser & McKee, Inc. determined that "it is unlikely that the landfill affected the water quality of the wellfield in the past." (CDM, 1986) MassGIS mapping shows that the landfill is situated in an area of a potentially productive medium-yield aquifer.

Of the private water supply testing which occurred in the area, only two tap water analytical results were available in the files reviewed. However, a discussion of some historical results, as well as results from January and February 1992 sampling, was available and has been included in Appendix D. Historically, tap water from three homes on Regina South Drive was analyzed and found to contain volatile organic compounds (VOCs) such as toluene, trichloroethene and xylene even though they were utilizing the public water supply. Figure 1.3-1 presents locations where groundwater samples were collected during the 1992 sampling period. The locations sampled, along with the tap water in the Rocco residence at the site (from a private well), were found to be free of contaminants (Callahan and Giddings, 1992).

The surface water drainage pathway from the Rocco Landfill is toward Sutton Brook and associated wetlands. Sutton Brook flows into the Shawsheen River which is located approximately 0.5 miles northwest of the disposal area. The Shawsheen River flows for approximately 10 miles north through the Towns of Tewksbury, Andover, and into Lawrence where it empties into the Merrimack River. There are no surface water intakes downstream of the Shawsheen River's confluence with the Merrimack River. However, the Town of Andover has a well located along the banks of the Shawsheen River approximately 3.2 miles north of the confluence with Sutton Brook. The site is located in the 100-year flood plain. Total wetland frontage along the 15-mile surface water pathway is approximately 75 miles (NUS, 1991a).

There are several reservation areas along the banks of the Shawsheen, including Hale Reservation (located approximately 3.5 stream miles north of the disposal area); Shawsheen River Reservation (located approximately 4.4 stream miles north of the area); and Indian Ridge Reservation (located approximately 5.1 stream miles north of the area). The reservations are open to the public for hiking and picnicking. The Shawsheen is also stocked with trout for fishing and is used for canoeing when the water level is high enough (NUS, 1991a).

Other potential environmental and public health sensitive receptors near the site include a

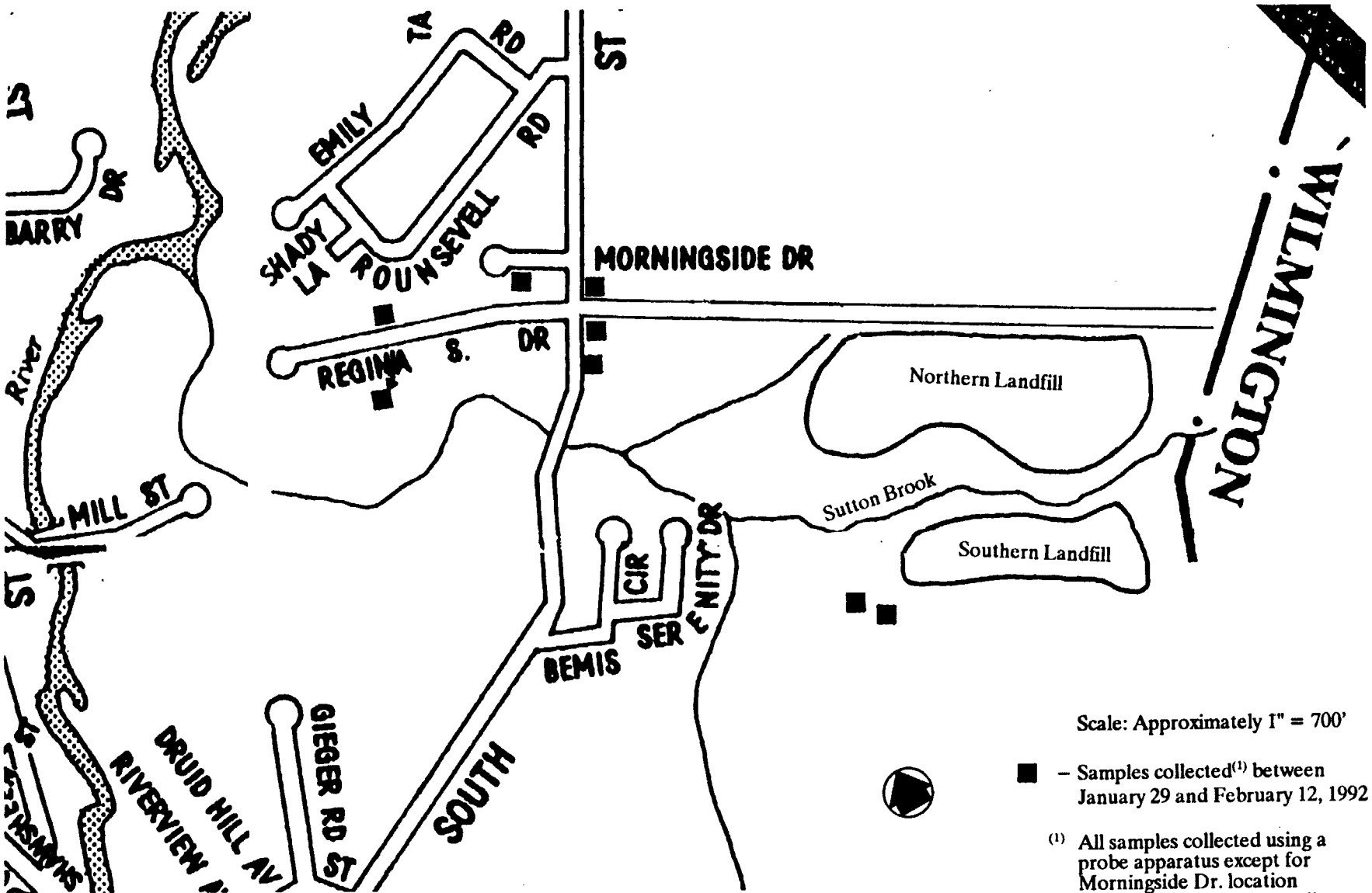


FIGURE 1.3–1. HISTORICAL RESIDENTIAL GROUNDWATER SAMPLING LOCATIONS

Zone II drinking water supply (approximately 0.6 miles southeast of the site), residential homes and a farm. There are no nearby ocean sanctuaries, schools, or hospitals. It is unknown whether or not day care centers and elderly housing exist near the site. The site is not in an Area of Critical Environmental Concern (ACEC).

1.3.5 LANDFILL GAS EMISSIONS AND SURROUNDING AIR QUALITY

Odor complaints from nearby residences are well documented in the available files and have occurred at least as far back as 1973. These complaints have resulted in testing and air quality sampling at the site. One documented incident resulted in testing with an explosimeter, but nothing was detected at the time of the testing (Morris, 1987). During another site walkover, fluctuating readings from a flame ionization detector (FID) near the northern landfill lobe indicated the possible presence of methane. Elevated readings were also recorded immediately above the surface of shallow waters running through a marshy area southwest of the southern landfill lobe. However, during site activities one month later, no readings above background were recorded (DHHS, 1992).

Ambient air monitoring was performed in July and August 1992 at and around the landfill (including residential streets). Samples were analyzed for benzene and toluene. Maximum concentrations of benzene and toluene were 0.3 and 1.3 parts per billion (ppb), respectively (McGrath, 1992).

In January 1992, a soil gas survey was performed in the Regina S. Drive neighborhood and along South Street to determine if infiltration was occurring in the public water supply. No VOCs were detected during the survey (Callahan and Giddings, 1992).

Air sampling and analysis conducted by the Air Quality Surveillance Branch of the Massachusetts DEQE in March 1988 showed the presence of acetone, benzene, methyl ethyl ketone, toluene, trichloroethylene and xylene at ppb levels. The results discussion stated that the VOCs detected were not the likely cause of any observed odors in the neighborhood (McGrath, 1988). Another known source of odors in the area is the nearby piggery.

Results of the studies discussed above are presented in the following section.

Documented fires have occurred at the landfill since its temporary assignment as a sanitary landfill in 1961 (Pottle, 1963; Clougherty, 1979). The landfill had previously been a burning dump. The documented fires seem to just have been a continuation of this process. Partial documentation of what appears to be Board of Health meeting minutes from July 21, 1964 show that a Board member stated the reason for burning at the dump was because the town did not have the money to make a land-filled dump (Board of Health, 1964).

1.3.6 SUMMARY OF EXISTING ANALYTICAL DATA

Table 1.3-1 presents a summary of sampling results available in the files reviewed. This includes samples collected of groundwater, surface water, sediment, surface soil, leachate, ambient air and soil gas which directly relate to Rocco Landfill and surrounding residences. For most of the included events, the only records of the sampling locations were the sample names. However, some noted locations are presented on figures along with their data in Appendix D. Results of samples collected at the nearby production wells were not included (see Section 1.3.4 discussion). Documentation exists of other samples collected, but results were not always present in the files available to M&E.

TABLE 1.3–1. SUMMARY OF HISTORIC SAMPLING [1]

Date Sampled	Sampling Locations	Matrix Sampled	Known Analyses Performed	Section 1.3.1 Reference [2]	Summary of Significant Results
08/04/76	Monitoring Well–M–1–76 (Near Rocco's Landfill)	GW	Turb., color, odor, pH, alk., SO_4, Hard., Ca, Mg, Na, K, Fe, Mn, SiO_2, Cl, NH_3, Cond., Nitrate, Nitrite, Cu	Lab Results, August 1976	Cu – 0.03 mg/L
11/17/76	Monitoring Well–M–1–76 (Near Rocco's Landfill)	GW	Turb., color, odor, pH, alk., SO_4, Hard., Ca, Mg, Na, K, Fe, Mn, SiO_2, Cl, NH_3, Cond., Nitrate, Nitrite, Cu	Lab Results, Nov. 29, 1976	Cu – 0.01 mg/L
05/08/79	Sutton Brook at South Street	SW	COD, BOD, pH, alk., color Fe, NH_3, Sulfate	Lord Letter, Oct. 15, 1979	No significant detections
06/26/79	Tewks., Sutton Brook – South Street, Leachate	Leachate	COD, BOD, pH, alk., solids, NH_3, Fe, Mn, Cond., Nitrate	Lab Results, July 23, 1979	No significant detections
07/10/79	Tewksbury Brook 1015 South Street	SW	COD, BOD, pH, alk., solids, NH_3, Fe, Cr, Nitrate, Mn, SO_4	Lord Letter, Oct. 15, 1979	Cr – 0.04 mg/L
08/04/82	Wilmington, Culvert @ Rt. 93	SW	COD, BOD, pH, alk., solids, TKN, NH_3, P, Cl, Cond., Pb, Cr, Cd, Ni, Coliform	Meeting Memo, August 27, 1982	Total Coliform – 9,300 MPN/100 ml
	Tewksbury, Rocco's Landfill Upstream	SW			Total Coliform – 4,600 MPN/100 ml
	Tewksbury, Brook @ S. Street	SW			Total Coliform – 930 MPN/100 ml, Pb – 0.01 mg/L
08/05/82	Wilmington stream, culvert @ Stage Coach Rd. Tewksbury stream, culvert @ s/s landfill Tewks. stream, S.W. of old coverd landfill Rocco's Tewks. stream, brook of Zemis? Circle	SW	Ni, Pb, Cr, Cd	Meeting Memo, August 27, 1982	No detections
06/24/83	Rocco's LF, R.R. bed at culvert, upstream	SW	Method 624–Organics by Purge and Trap, Ca, Mg, pH, Cond., Mn, Fe, Na, K, Cu, Pb, Cr, As	Lab Results, August 2, 1983	Pb – 0.02 mg/L, As – 0.009 mg/L
	Rocco's LF, 50' upstream culvert between landfill	SW			Pb – 0.07 mg/L, As – 0.012 mg/L, Acetone – 77 µg/L, MEK – 26 µg/L, Total BTEX – 305.6 µg/L, Chlorobenzene – 3.7 µg/L
	Rocco's LF, Leachate @ Horseshoe	Leachate			Pb – 0.03 mg/L, As – 0.015 mg/L, Acetone – 360 µg/L, MEK – 220 µg/L, MIBK – 18 µg/L
	Culvert at Old Garage Rd., downstream of R.R. bed	SW			As – 0.110 mg/L

TABLE 1.3–1 (Continued). SUMMARY OF HISTORIC SAMPLING [1]

Date Sampled	Sampling Locations	Matrix Sampled	Known Analyses Performed	Section 1.3.1 Reference [2]	Summary of Significant Results
03/10/88	Rocco Landfill sludge sample	Soil	TPH	Lab Results, April 4, 1988 Adams Memo, March 25, 1988	TPH – 400 µg/g, possibly kerosene
	Access Rd. (Right)	Air	Acetone, Benzene, MEK, MIBK, Toluene, TCE, Xylene		Benzene – 1 ppb, MEK – 22 ppb, Toluene – 53 ppb, TCE – 15 ppb, Xylene – 36 ppb
	Near Sludge Pile	Air			Benzene – 1 ppb, Toluene – 334 ppb, TCE – 15 ppb, Xylene – 33 ppb, Acetone identified
	Landfill Dome	Air			Toluene – 14 ppb, TCE – 14 ppb, Xylene – 11 ppb, Acetone identified
	Access Rd. (Left)	Air			Benzene – 1 ppb, Toluene – 61 ppb, TCE – 17 ppb, Xylene – 29 ppb
	Entrance of drum bunghole	Air			Benzene – 1 ppb, Toluene – 14 ppb, TCE – 13 ppb, Acetone identified
10/06/89	LS–01 (see Appendix D for location)	Leachate	VOC screening	NUS, June 25, 1991	Benzene – 32.0 ppb, Chlorobenzene – 12.0 ppb, m–Xylene – 1,200 ppb
	LS–02 (see Appendix D for location)	Leachate			No significant detections
	LS–03 (see Appendix D for location)	Leachate			m–Xylene – 10.0 ppb
	LS–04 (see Appendix D for location)	Leachate			No significant detections
	LS–05 – Blank	Leachate			No significant detections
	LS–06 (see Appendix D for location)	Leachate			No significant detections
	SD–01 (see Appendix D for location)	Sediment	VOCs, SVOCs, PCBs/Pesticides, Inorganics		Total VOCs – 53 µg/Kg, Total SVOCs – 1,036 µg/Kg, Ca – 3,320 mg/Kg, Pb – 25.1 mg/Kg, Ni – 6.6 mg/Kg, Zn – 44.3 mg/Kg
	SD–02, Bkgd. (see Appendix D for location)	Sediment			Ca – 652 mg/Kg, Pb – 2.9 mg/Kg, Cu – 4 mg/Kg
	SD–03 (see Appendix D for location)	Sediment			Total SVOCs – 1,232 µg/Kg, 4,4'–DDD – 7.9 µg/Kg,gamma–Chlordane – 1.5µg/Kg, Cu – 31.3 mg/Kg, Pb – 18 mg/Kg, Zn – 25.7 mg/Kg
	SS–02 (see Appendix D for location)	Surf. Soil	VOCs, SVOCs, PCBs/Pesticides, Inorganics		Total SVOCs – 4,473 µg/Kg, 4,4'–DDE –30 µg/Kg, 4,4'–DDD – 29 µg/Kg, alpha–Chlordane – 40 µg/Kg, gamma–Chlrodane – 59 µg/Kg, high inorganic detections

TABLE 1.3-1 (Continued). SUMMARY OF HISTORIC SAMPLING [1]

Date Sampled	Sampling Locations	Matrix Sampled	Known Analyses Performed	Section 1.3.1 Reference [2]	Summary of Significant Results
10/06/89 (cont.)	SS-03 (see Appendix D for location)	Surf. Soil			Total SVOCs - 5,383 µg/Kg, high inorganic detections
	SS-04 (see Appendix D for location)	Surf. Soil			Xylene - 140 µg/Kg, Total SVOCs - 906 µg/Kg, 4,4'-DDE -39 µg/Kg, high inorganic detections
	SS-05 (see Appendix D for location)	Surf. Soil			Total SVOCs - 1,276 µg/Kg, high inorganic detections
	SS-06 (see Appendix D for location)	Surf. Soil			Total SVOCs - 1,290 µg/Kg, gamma-BHC - 8.9 µg/Kg, 4,4'-DDE -9.1 µg/Kg, gamma-Chlrodane - 3.9 µg/Kg, high inorganic detections
	SS-07 (see Appendix D for location)	Surf. Soil			Total SVOCs - 228 µg/Kg, low inorganic detections
	SS-08 (see Appendix D for location)	Surf. Soil			Total SVOCs - 3,179 µg/Kg, Aroclor-1242 - 2,500 µg/Kg, high inorganic detections
	SS-09 (see Appendix D for location)	Surf. Soil			Total VOCs - 2,773 µg/Kg, Total SVOCs - 144,230 µg/Kg, Aroclor-1254 - 500 µg/Kg, very high inorganic detections
	SS-10 (see Appendix D for location)	Surf. Soil			Total VOCs - 693 µg/Kg, Total SVOCs - 19,810 µg/Kg, Aroclor-1254 - 610 µg/Kg, very high inorganic detections
	SS-10R/D (see Appendix D for location)	Surf. Soil			Total VOCs - 441 µg/Kg, Total SVOCs - 11,404 µg/Kg, very high inorganic detections
	SS-12, Offsite Bkgd. (see Appendix D for location)	Surf. Soil			Total SVOCs - 93 µg/Kg, Endosulfan sulfate - 27 µg/Kg, low inorganic detections
	SS-13, Onsite Bkgd. (see Appendix D for location)	Surf. Soil			Low inorganic detections
	SS-11 - Blank	Water	VOCs		Total VOCs - 32 µg/L

TABLE 1.3–1 (Continued). SUMMARY OF HISTORIC SAMPLING [1]

Date Sampled	Sampling Locations	Matrix Sampled	Known Analyses Performed	Section 1.3.1 Reference [2]	Summary of Significant Results
12/91	Station 10 (see Appendix D for location)	SW	VOCs, PNAs, PCBs/Pesticides, Inorganics	Dept. of Health March 25, 1992	As – 3.18 mg/L, Pb – 0.084 mg/L
	Stations 11–15 (see Appendix D for locations)	SW			As – 0.015 mg/L, Pb – 0.050 mg/L
	Station 10 (see Appendix D for location)	Sediment			As – 660 mg/Kg
	Station 14 (see Appendix D for location)	Sediment			Pb – 270 mg/Kg
	Stations 11–13,15 (see Appendix D for locations)	Sediment			No significant detections
01/28/92	Six soil gas locations (see Appendix D for locations) Off–site in the Regina S. neighborhood	Soil Gas	VOCs	DEP Memo, March 22, 1992	No detections
01/29/92	Wetland area south of southern lobe	GW	VOCs – portable GC	DEP Memo, March 22, 1992	No detections
	Sutton Brook, south of eastern lobe	SW	VOCs – portable GC		Toluene – 450 ppb, Ethyl benzene – 75 ppb
02/92	Six off–site locations (see Appendix D for locations)	GW	VOCs – EPA Method 8240	DEP Memo, March 22, 1992	No detections
	Wetland behind 121 Regina S. Drive	SW	VOCs – EPA Method 8240		Total VOCs – 54 µg/L
	Man–made pond behind 70 Regina S. Drive	SW	VOCs – EPA Method 8240		No detections
03/10/92	Loom business #1, pile of soil	Soil	TPH, Pb	Carbone letter, April 2, 1992	TPH – 1,100 µg/g, presence of weathered No. 6 fuel oil, Pb – 55 mg/Kg, duplicate shows TPH – 1,400 µg/g
07/29/92	Serenity Dr., Landfill Mound, Regina Dr., Landfill Mound Access Road, E. Side of Mound near breakout, Morningside Dr., Rounsevell Rd. (see Appendix D for locations)	Air	VOCs, 2–hr time–weighted, instantaneous grab also	McGrath letter, Oct. 9, 1992	Benzene ranged from not detected to 0.3 ppb, Toluene ranged from not detected to 1.3
08/20/93	Roccos/Fittery Rsd. #1, left end of pool, under liner	Soil	VOCs – EPA Method 8240	Lab Results, August 2, 1983	Toluene – 0.61 µg/g
	Roccos/Fittery Rsd. #2, Btw. Collins Brook & end of pool	Soil			Toluene – 0.81 µg/g

Notes:

[1] Results compiled are only for data available in files reviewed. In many cases, only a summary paragraph was available.

[2] References noted have been included in Appendix D.

SECTION 1.4
HYDROGEOLOGICAL INFORMATION

The geology is discussed in terms of the regional and site bedrock, structural and surficial geology. The hydrogeology is discussed in terms of the regional and site surface water and groundwater. The majority of the groundwater data used in this hydrogeological assessment was collected from the monitoring wells installed during investigations conducted in June 1995.

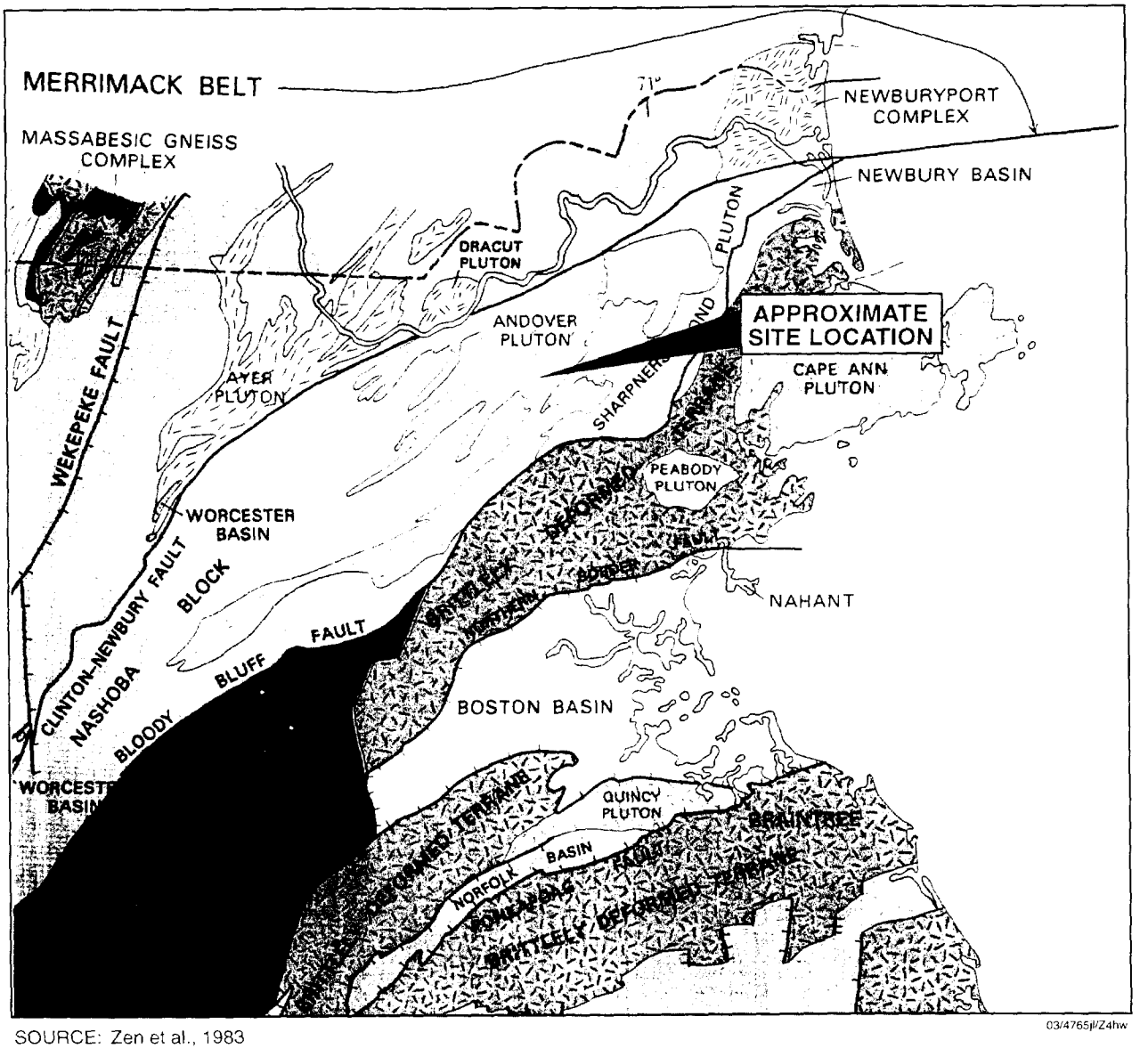
1.4.1 REGIONAL GEOLOGY

The regional geology of the Rocco Landfill site vicinity is discussed in terms of surficial geology and bedrock geology. The geology of the site is discussed within the context of the regional geology.

1.4.1.1 Regional Bedrock and Structural Geology

The site is underlain by the Nashoba Terrane, which is a distinct exotic crustal block that trends northeast-southwest across eastern New England (Figure 1.4-1). The Nashoba Terrane is bounded on the north by the Clinton-Newbury Fault which separates the Nashoba Terrane from the eastern Merrimack Trough, and on the south by the Bloody Bluff Fault which separates the Nashoba Terrane from the Avalonian Terrane (Nelson, 1987). The Nashoba Terrane is composed of Ordovician aged, mafic volcanic and volcanogenic sedimentary rocks that were polydeformed and metamorphosed from the mid-Ordovician to the Silurian. Widespread plutonism within the terrane included the intrusion of alkaline-granitic and mafic magmas which are thought to have produced heat that likely generated the Andover Granite through the anatexis or remelting of preexisting sedimentary rocks (Hepburn et al., 1993).

The most significant tectonic features in the close proximity of the study area are the Bloody-Bluff Fault, approximately 4.7 miles to the southeast and the Clinton-Newbury Fault, approximately 5.9 miles north, northwest of the site both of which bracket the Nashoba



SOURCE: Zen et al., 1983

03/4765jl/Z4hw

NASHOBA ZONE (SILURIAN AND OLDER ROCKS)

INTRUSIVE ROCKS

Sgr — **Orange-pink, rusty-weathering, medium- to coarse-grained biotite granite to granodiorite (Silurian)**—Locally porphyritic. Intrudes Ssqd

Ssqd — **Sharpners Pond Diorite (Silurian)**—Non-foliated, medium-grained equigranular biotite-hornblende tonalite and diorite. Intrudes SOagr, OZn, OZf

Ssaqd — **Straw Hollow Diorite and Assabet Quartz Diorite undifferentiated (Silurian)**—Gray, medium-grained, slightly-foliated biotite-hornblende diorite and quartz diorite. Intrudes OZn

igd — **Granodiorite of the Indian Head pluton (age uncertain)**—Light-gray to pinkish-gray, fine- to medium-grained biotite granodiorite, and gray fine-grained hornblende-biotite tonalite. Intrudes OZm

SOagr — **Andover Granite (Silurian or Ordovician)**—Light- to medium-gray, foliated, medium- to coarse-grained muscovite-biotite granite; pegmatite masses common. Includes Acton Granite (Silurian or Ordovician). Intrudes OZn

mgr — **Light-gray muscovite granite (age uncertain)**

Original includes color coding.

FIGURE 1.4-1. BEDROCK MAP OF ROCCO LANDFILL AREA

Terrane. The traces of both faults trend northeast-southwest (Nelson, 1987) which is subparallel to foliation patterns observed on outcrops within 0.5 miles of the site.

1.4.1.2 Regional Surficial Geology

The surficial geology in the site vicinity is primarily the result of the advancement and ablation (retreat) of the last (Wisconsinin) glacial period which left deposits of unconsolidated glacial till overlain by stratified drift deposits of gravel, sand and silt (Holland 1980). All of the glacial deposits overlie bedrock. Locally the glacial sediments are overlain by Quaternary (recent) alluvial and organic-rich wetlands deposits (Figure 1.4-2).

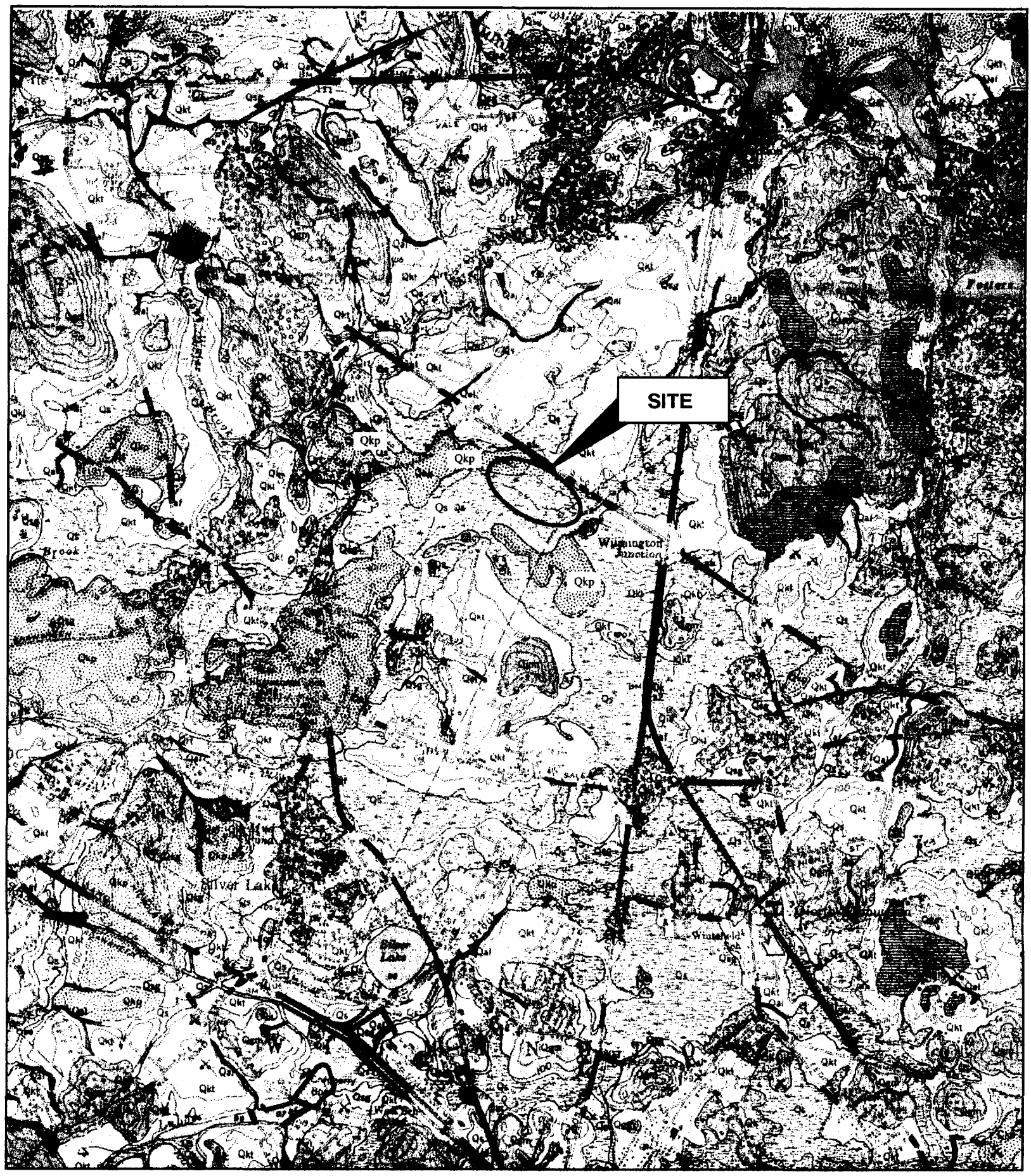
1.4.2 SITE GEOLOGY

The geology of the site was determined by the logging of split-spoon samples collected during the installation of 10 monitoring wells (MW) sampled at 5-foot intervals. A summary of the site geology is provided in cross-sections found in Figures 1.4-3 to 1.4-7. Geologic boring logs are provided in Appendix A.

1.4.2.1 Site Surficial Geology

The surficial geology of the site area is characterized by recent alluvial and swamp deposits underlain by stratified glacial-drift deposits interpreted to be Kame-Plain deposits (Castle, 1959) and unconsolidated glacial till deposits. The site ranges in elevation from approximately 77 to 173 feet above mean sea-level with the topography being very irregular due to the landfilling and excavation activities that have taken place in the last several decades.

The site is characterized by having two landfilled hills surrounded by smaller hills and wetlands. The larger (northern) landfilled hill and the smaller (southern) landfilled hill are separated by a small stream valley and surrounded by wetlands which are present on all sides of both landfilled hills. On the west-northwest side of the site, Kame-Plain (sand and gravel) deposits have been quarried, as evident along the north side of the western access road,

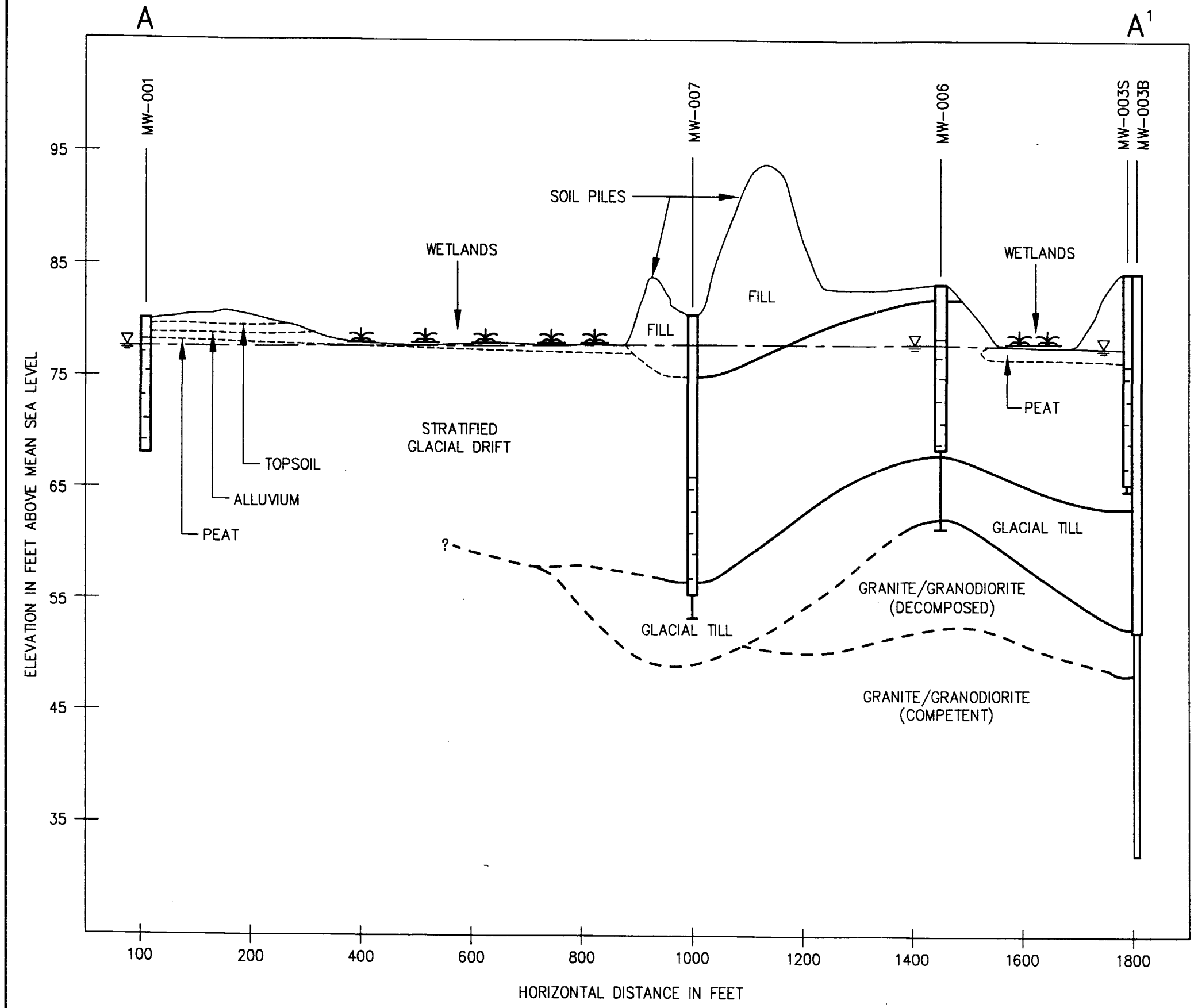


SOURCE: Castle, 1959; USGS, 1950

02b/4765jl/Z4hw

Original includes color coding.

FIGURE 1.4-2.
SURFICIAL GEOLOGICAL MAP
OF THE ROCCO LANDFILL
SITE AREA



SCALE: 1" = 200' HORZ.
1" = 10' VERT.

LEGEND

GEOLOGIC CONTACT
DASHED WHERE INFERRED
QUERIED WHERE UNKNOWN

MW-007 — MONITORING WELL ID

GROUNDWATER TABLE
ON 6/28/95

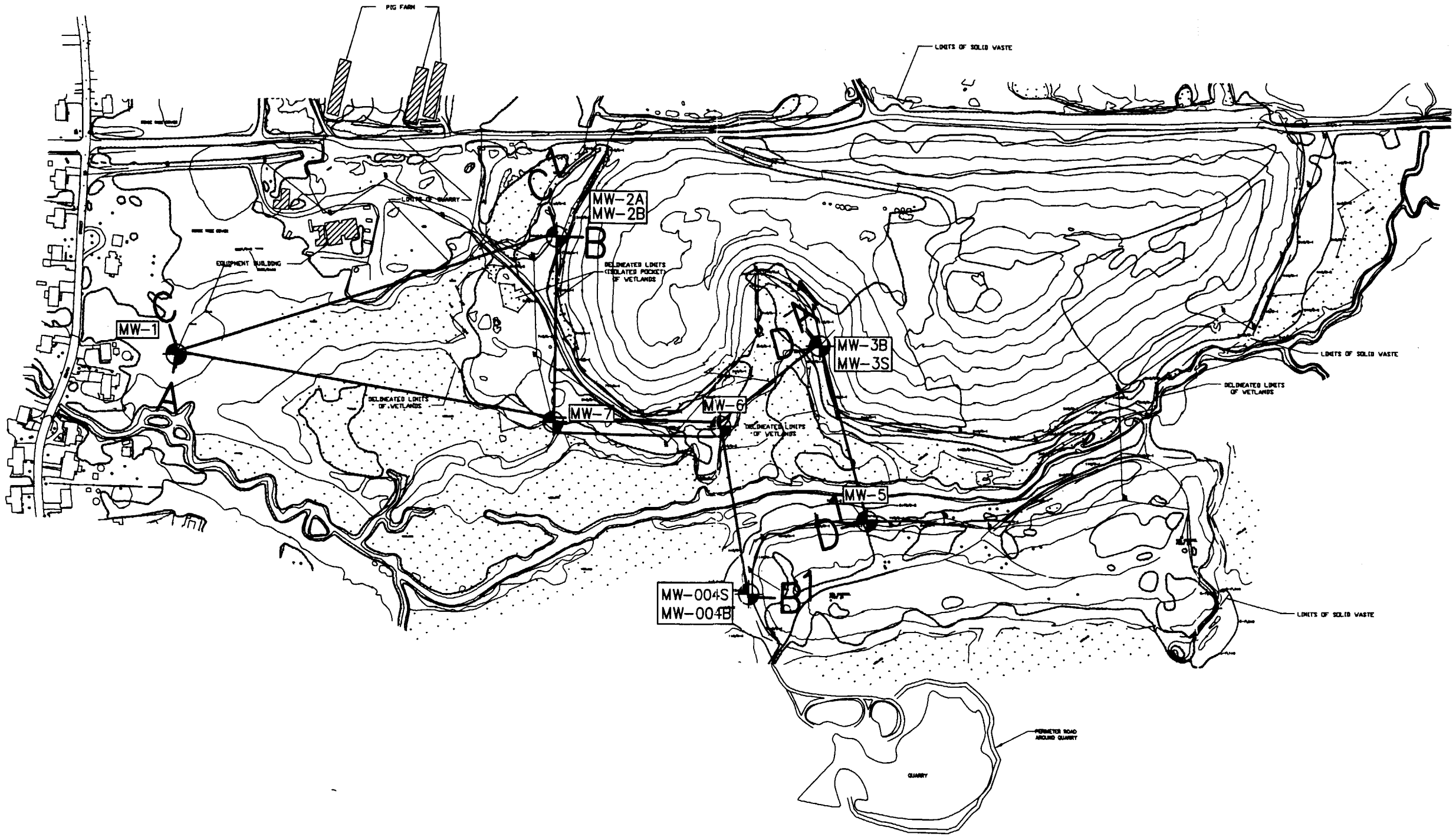
MONITORING WELL DETAIL

NOTE: LOCATION OF CROSS-SECTION A-A^1 SHOWN ON FIGURE 1.4-3.

REFERENCES:
BASE MAP COMPILED BY SEA ENGINEERS, MARCH 1995, FOR THE TOWN OF TEWKSBURY, MA.

METCALF & EDDY

MA DEPARTMENT OF ENVIRONMENTAL PROTECTION
ROCCO LANDFILL INITIAL SITE ASSESSMENT
FIGURE 1.4-4
GEOLOGIC CROSS-SECTION A - A^1



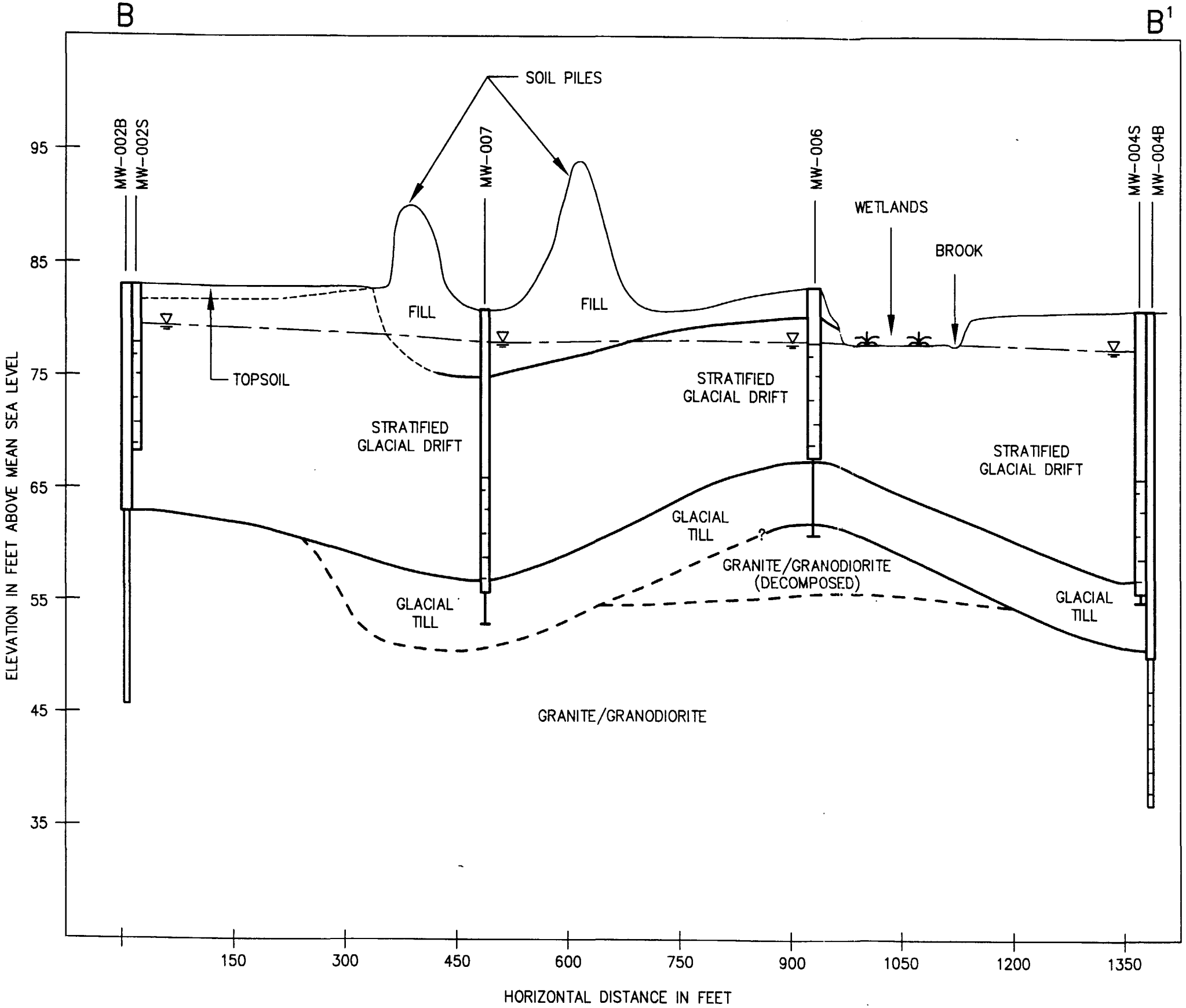
REFERENCES:

BASE MAP COMPILED BY SEA ENGINEERS, MARCH 1995, FOR THE TOWN OF TEWKSBURY, MA

METCALF & EDDY

MA DEPARTMENT OF ENVIRONMENTAL PROTECTION
ROCCO LANDFILL INITIAL SITE ASSESSMENT

FIGURE 1.4-3
LOCATIONS OF GEOLOGIC CROSS-SECTIONS



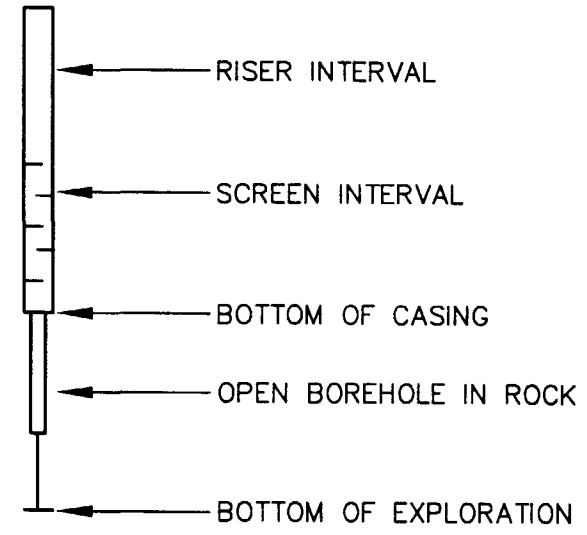
SCALE: 1" = 150' HORZ.
1" = 10' VERT.

LEGEND

GEOLOGIC CONTACT
DASHED WHERE INFERRED
QUERIED WHERE UNKNOWN

MW-007 — MONITORING WELL ID

GROUNDWATER TABLE ON 6/28/95



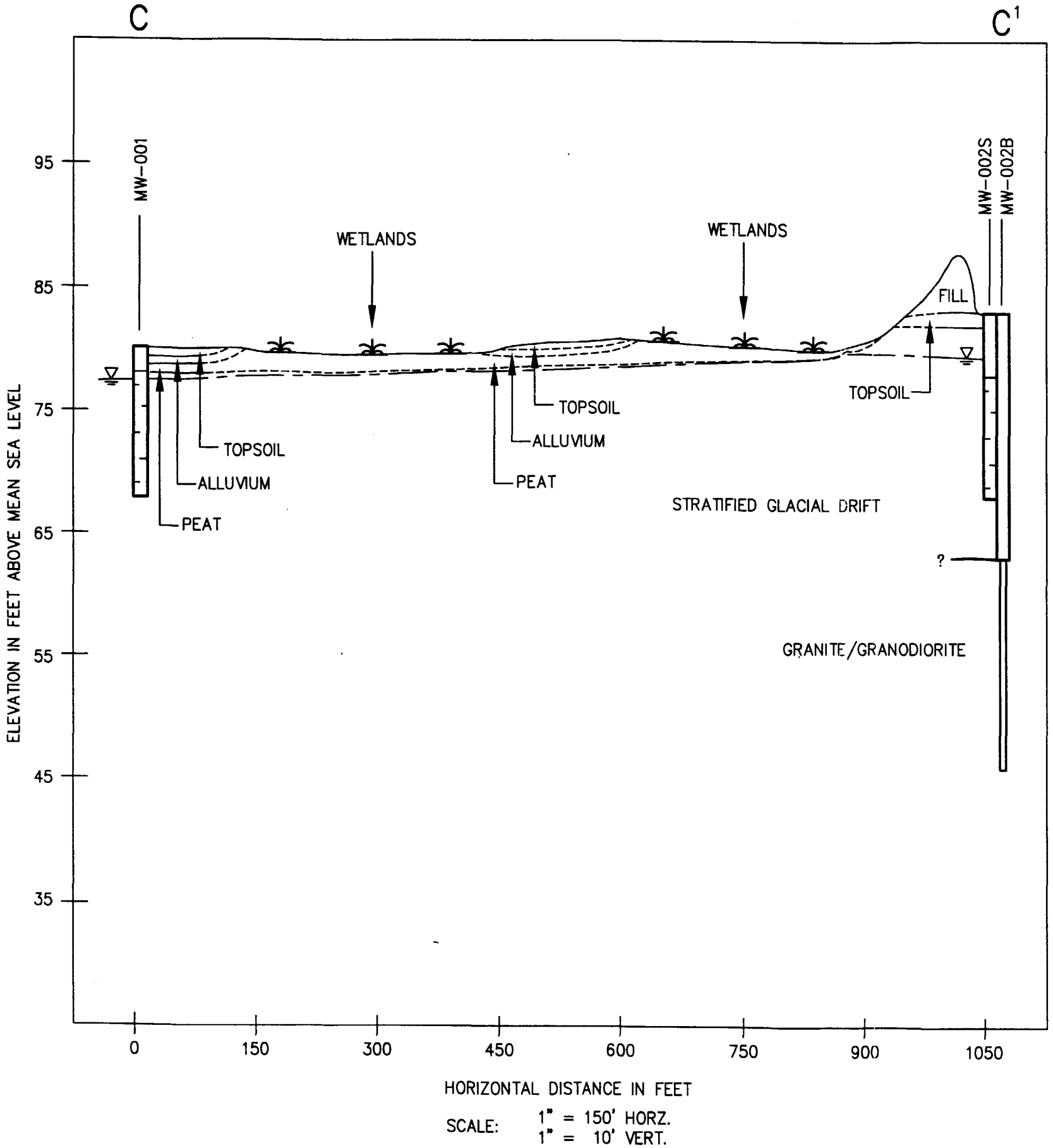
MONITORING WELL DETAIL

NOTE: LOCATION OF CROSS-SECTION B – B^1 SHOWN ON FIGURE 1-4.3.

REFERENCES:
BASE MAP COMPILED BY SEA ENGINEERS, MARCH 1995, FOR THE TOWN OF TEWKSBURY, MA

METCALF & EDDY

MA DEPARTMENT OF ENVIRONMENTAL PROTECTION
ROCCO LANDFILL INITIAL SITE ASSESSMENT
FIGURE 1.4-5
GEOLOGIC CROSS-SECTION B – B^1



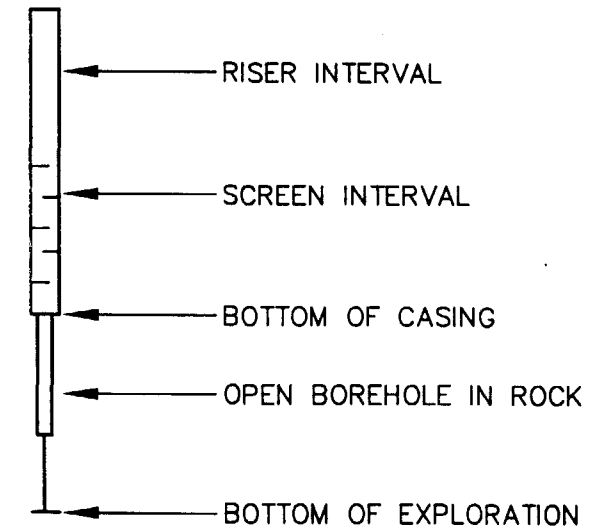
SCALE: 1" = 150' HORZ.
1" = 10' VERT.

LEGEND

GEOLOGIC CONTACT
DASHED WHERE INFERRED
QUERIED WHERE UNKNOWN

MW-007 — MONITORING WELL ID

GROUNDWATER TABLE ON 6/28/95



MONITORING WELL DETAIL

NOTE: LOCATION OF CROSS-SECTION C – C1 SHOWN ON FIGURE 1-4.3.

REFERENCES:
BASE MAP COMPILED BY SEA ENGINEERS, MARCH 1995 FOR THE TOWN OF TEWKSBURY, MA

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FIGURE 1.4-6
GEOLOGIC CROSS-SECTION C – C1

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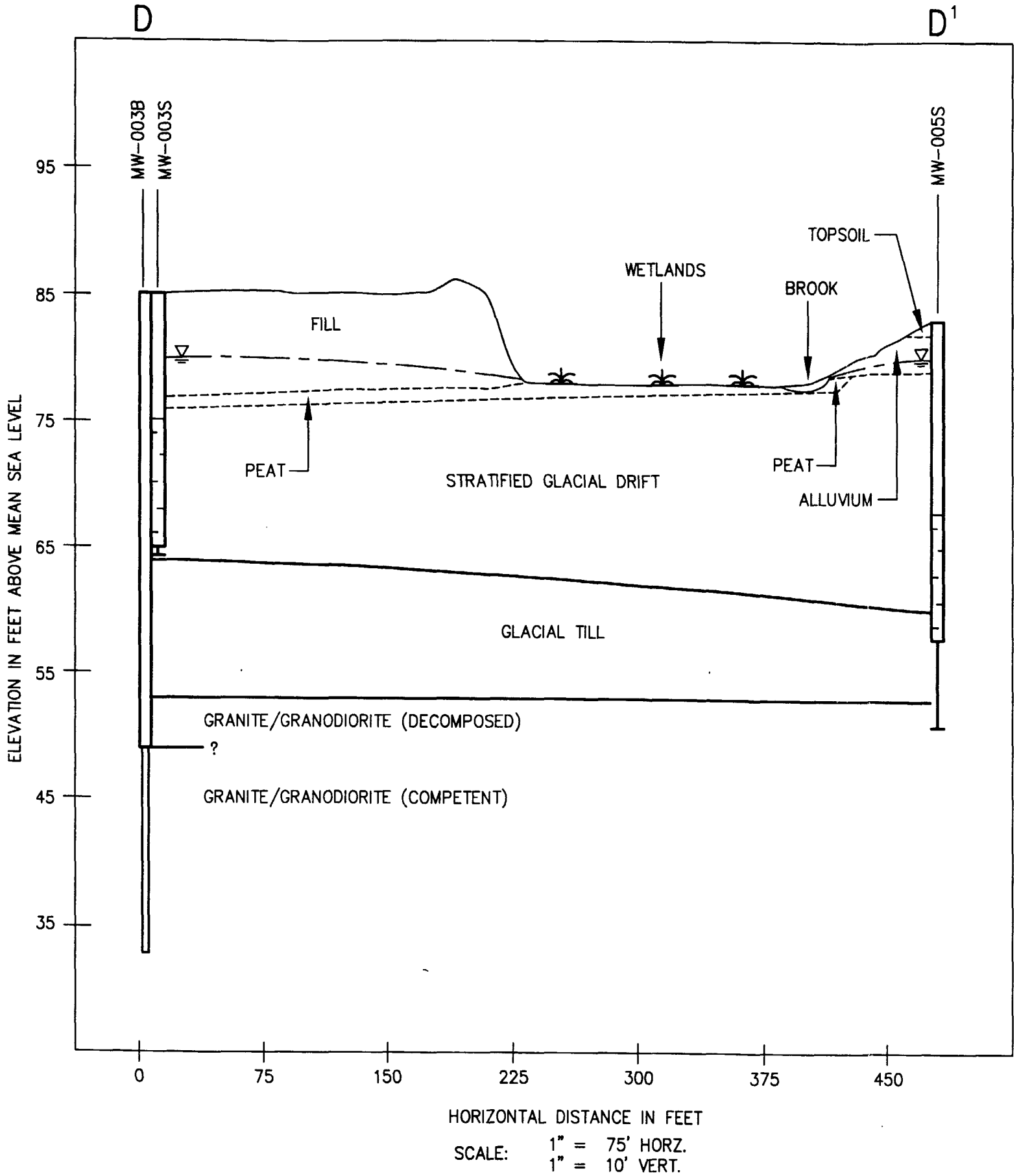
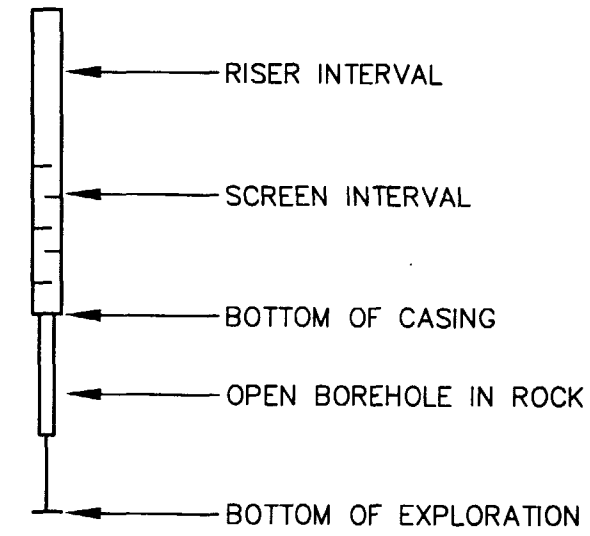


LEGEND

GEOLOGIC CONTACT
DASHED WHERE INFERRED
QUERIED WHERE UNKNOWN

MW-007 — MONITORING WELL ID

GROUNDWATER TABLE ON 6/28/95



MONITORING WELL DETAIL

NOTE: LOCATION OF CROSS-SECTION D – D1 SHOWN ON FIGURE 1-4.X.

REFERENCES:

BASE MAP COMPILED BY SEA ENGINEERS, MARCH 1995, FOR THE TOWN OF TEWKSBURY, MA.

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FIGURE 1.4-7
GEOLOGIC CROSS-SECTION D – D1

leaving small positive relief features. Other positive relief features include several debris piles consisting of sand, gravel, boulders and other debris which may have been disposed of during landfilling and excavation activities.

Overburden thickness in borings that achieved depth to bedrock ranges from 20-32 feet. According to monitoring well installation data, overburden is thinnest at MW-002 and MW-006 where the depth to bedrock is approximately 20 feet and thickest at MW-007 where the depth to bedrock is approximately 31 feet.

Peat deposits were found at MW-001, and MW-003 at depth of several feet below the surface with thicknesses of 1.0-1.5 feet. The majority of the overburden sediments on site consist of glacial deposits which can be divided into two lithologies; stratified glacial drift and unconsolidated glacial till. The stratified glacial drift deposit is characteristically a gray or tannish-gray silty coarse to fine sand with some gravel. Stratified drift was encountered in all borings installed during the June 1995 field activities and ranged in thickness from 12 feet at MW-006 to 24 feet at MW-004. Glacial till was encountered at MW-003, MW-004, MW-005, MW-006, and MW-007 and is characteristically a gray, dense silt with varying amounts of coarse to fine sand and gravel, and a high degree of cohesiveness. The thicknesses of glacial till range from 5.5 feet at MW-006 to 10 feet at MW-003.

1.4.2.2 Site Bedrock Geology

The bedrock geology of the site is based on the installation of three bedrock wells at MW-002B, 003B, and 004B. Weathered bedrock was also encountered at MW-006. The predominant bedrock lithology at these locations is composed of 50-60% feldspar, 40-50% quartz and 10-20% mica and is interpreted to be the *Andover Granite* (Nelson 1987; Hepburn et al., 1993). Some of the bedrock encountered at the site had higher percentages of mafic minerals which result in the bedrock being interpreted as a granodiorite member of the *Andover Granite*. At MW-003B and 006S the bedrock was found to have a weathered surface. The depth to bedrock ranged from 22 feet at MW-006S to 36 feet at MW-003B.

1.4.3 REGIONAL HYDROGEOLOGY

Regional Hydrogeology is discussed in terms of the regional surface water patterns of the Shawsheen River Basin and its characteristics as well as regional groundwater patterns. The site hydrogeology is discussed in terms of the regional hydrogeology.

1.4.3.1 Regional Surface Water

The site is located within the Shawsheen-Merrimack River Drainage Basin. The Shawsheen River drains a 77-square mile area of northeastern Massachusetts with many small tributaries. The Shawsheen River is a north flowing river with most of its major tributaries flowing east to west or west to east. The site is located on Sutton Brook, an east to west flowing tributary of the Shawsheen River. The regional groundwater flow is to the north based on regional surface water flow and the regional topography.

The Shawsheen River Basin is characterized by small hills and wetlands with relatively low topographic relief. The lowest topographic elevation on the Shawsheen River is 10 ft. above sea-level at the mouth of the river near Lawrence, MA. The highest topographic elevation is 200-300 ft. in the hills surrounding the rivers' source near the Bedford-Lincoln town line. The hydraulic gradient for the Shawsheen River is 3.8 ft./mile as reported by Gay and Delaney, 1980. In general, the area is comprised of many wetlands because of the low relief and poor drainage. The Shawsheen River Basin receives 40.7 inches of precipitation/year with an average annual runoff of 20.2 inches. The highest runoff occurs in late winter with an average of 3-4 inches/month and the lowest in autumn with less than 1 inch/month (Gay and Delaney, 1980).

1.4.3.2 Regional Groundwater

Regional groundwater in the overburden of the Shawsheen River Basin occurs mostly in stratified glacial drift deposits (ice contact and outwash deposits). Stratified glacial drift deposits provide the most favorable conditions for groundwater production (Gay and Delaney, 1980). Transmissivities in the Shawsheen River Basin have a minimum value of 10 ft^2/day in glacial till and glaciolacustrine deposits in the southern portion of the drainage

basin, to greater than 10,000 ft^2/day in stratified drift deposits found in the vicinity of the site (Gay and Delaney, 1980).

Groundwater recharge in the Shawsheen River Basin occurs in the late winter months (February and March) when runoff is highest, and evapotranspiration is lowest. Low groundwater recharge occurs in the summer months (May to September) when vegetative cover is the highest. This results in decreased groundwater storage which reduces the base-flow of surface-water streams (Gay and Delaney, 1980).

Regional bedrock groundwater storativity in the Shawsheen River Basin is generally low as groundwater is found only in joints and fractures, which are commonly small. Where joints and fractures are larger and more pervasive, groundwater yields and transmissivities increase. Locations with large and well-connected fractures have groundwater yields as high as 100 gal/min. Where joints area small and unconnected, transmissivities are low, with yields being as low as 10 gal/min.

1.4.4 SITE HYDROGEOLOGY

Discussion of the site hydrogeology is based on data from the 10 monitoring wells installed at the site during the June 1995 site investigations as well as within the context of the regional hydrogeology of the Shawsheen River Basin.

1.4.4.1 Site Surface Water

The site is located within the Sutton Brook watershed, which is part of the Shawsheen River drainage basin. The brook drains the majority of surface water from the site and flows in a westerly direction. Two branches of Sutton Brook enter the site, one from the east the other from the south. Both branches pass through densely vegetated wetlands before entering the site. The eastern branch flows between the two landfilled lobes located on the site and joins the southern branch downstream of the landfilled lobes. After the two branches join, Sutton Brook enters another densely vegetated wetland and flows through a residential area before joining with the Shawsheen river approximately 0.75 miles downstream from the site. At the time of the field investigation in June of 1995, a shallow pond was present on the south side

of the southern lobe. Because there was no observed in-flow or out-flow to the pond, it is believed that the pond is a perennial feature at the site.

1.4.4.2 Site Groundwater

Groundwater measurements were taken on June 28 and 29, 1995 during groundwater sampling and are summarized in Table 1.4-1. Well construction information and water quality data is presented in Section 1.7. A groundwater contour map was generated based on the data collected during the June 1995 field investigation (Figure 1.4-8). The contours suggest a west-southwesterly flow direction. Detailed hydrogeologic information of the landfills were not determined during this investigation because no monitoring wells were installed on the landfills. Therefore groundwater contours on the landfills are inferred. It is suspected that groundwater flow on the landfills is radial based on the topography and the fact that the landfills are not capped and may allow infiltration. In addition, the groundwater contours presented in Figure 1.4-8 do not include surface water elevations which may cause localized fluctuations in the site-wide groundwater flow.

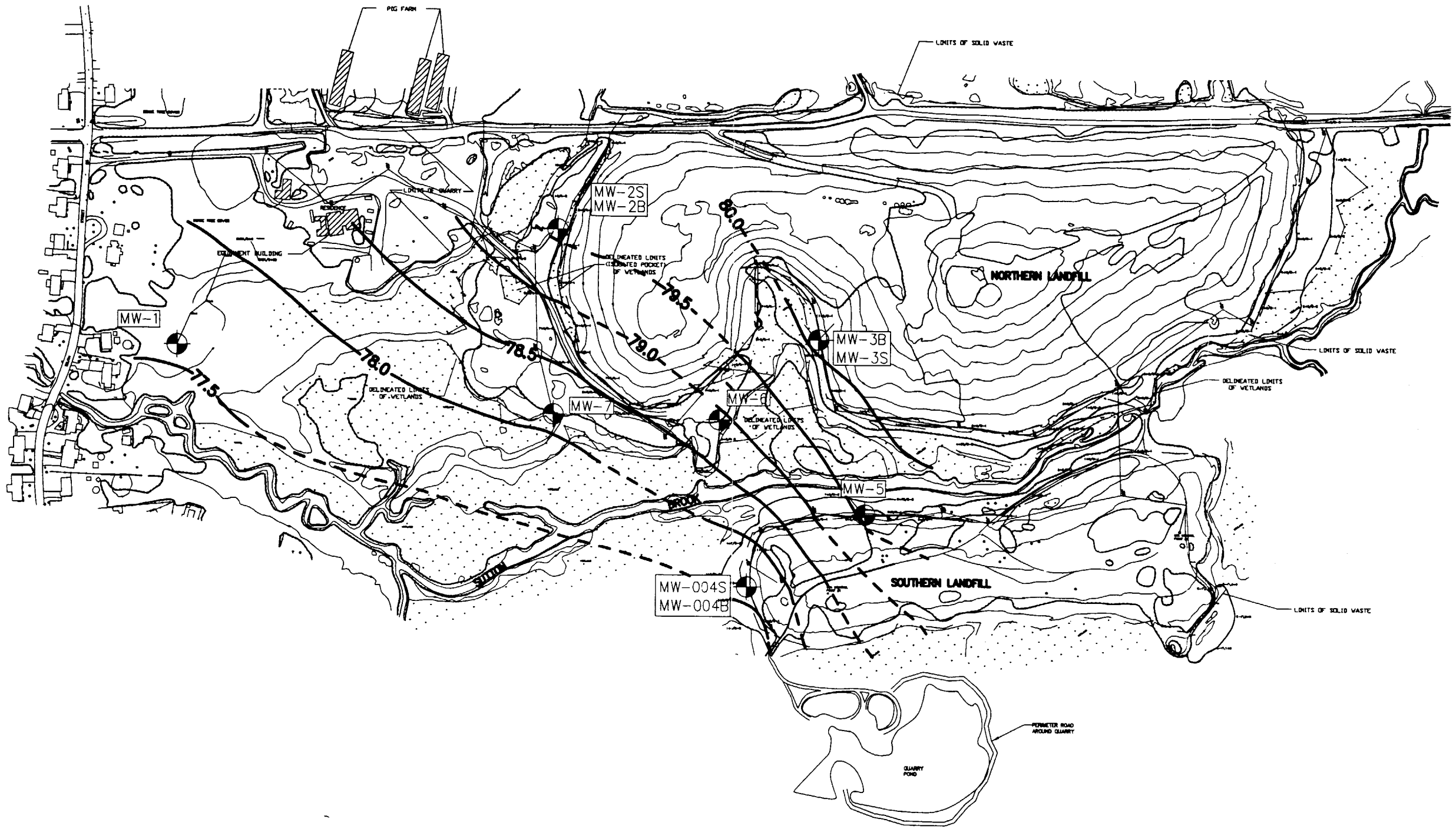
Horizontal hydraulic gradients range from a maximum of 5×10^{-3} (26.4 ft/mile) on the west side of the south lobe to approaching minimum values of 2×10^{-3} (10.5 ft/mile) on the western side of the site west of the landfill lobes. These values are considerably higher than average hydraulic gradients reported for the Shawsheen River Basin by Gay and Delaney 1980 of 7.2×10^{-4} (3.8 ft/mile).

Using the groundwater level data (Table 1.4-1) and well installation data (Table 1.7-1), vertical hydraulic gradients were calculated at the three well clusters installed at the site during the June 1995 study. These clusters include MW-002 S and B, MW-003 S and B, and MW-004 S and B. The vertical hydraulic gradients range from 1.6×10^{-2} at the MW-004 cluster to 3×10^{-4} at the MW-003 cluster. Vertical hydraulic gradients at the MW-002 and 003 clusters suggest that groundwater flow is upward, indicating that at the time of the groundwater measurements, groundwater from the bedrock was recharging the overburden. Vertical hydraulic gradients calculated at the MW-004 cluster suggest that groundwater flow is downward indicating that at the time of the groundwater measurements, groundwater from the overburden was recharging the bedrock.

TABLE 1.4–1. MONITORING WELL GROUNDWATER ELEVATIONS, JUNE 1995

Monitoring Well	Top of Casing Elevation (ft NGVD[1])	Depth to Water From Top of Casing (ft)	Groundwater Elevation (ft NGVD)
MW–001S	83.00	5.45	77.55
MW–002S	85.58	5.76	79.82
MW–002B	85.88	6.24	79.64
MW–003S	87.09	6.99	80.10
MW–003B	87.29	7.18	80.11
MW–004S	83.78	6.23	77.55
MW–004B	83.62	6.46	77.16
MW–005	85.77	6.00	79.77
MW–006	86.04	7.21	78.83
MW–007	83.78	5.64	78.14

Notes:
[1] NGVD – National Geodetic Vertical Datum



NOTES:

1. NO GROUNDWATER DATA COLLECTED FROM WITHIN THE LANDFILLS.
2. GROUNDWATER CONTOURS ARE DASHED WHERE INFERRED.
3. DATA COLLECTED ON 6/28/95 AND 6/29/95.

REFERENCES:

BASE MAP COMPILED BY SEA ENGINEERS,
MARCH 1995, FOR THE TOWN OF TEWKSBURY, MA.

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FIGURE 1.4-8
SHALLOW OVERBURDEN GROUNDWATER CONTOUR MAP

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Overburden Groundwater. Groundwater at the site generally exists in the overburden aquifer at an average depth to water of 5 feet below ground surface. Overburden wells were screened an average of 5 feet into the groundwater, generally 5 to 20 feet below ground surface. In most cases the overburden consisted a coarse-grained sediments (coarse to fine sand), interpreted to be stratified glacial drift. In the overburden the highest groundwater elevation occurs at MW-003S, with an elevation of 80.10 feet above sea-level. The lowest groundwater elevation was found at MW-001S (77.55 feet above sea-level).

Bedrock Groundwater. Groundwater is present in the crystalline bedrock underlying the site. Groundwater is contained and transmitted in the very fractured weathered bedrock or in secondary interstices such as joints and fractures in more competent bedrock. Bedrock wells were installed at a minimum depth of 15 feet into bedrock. If possible, wells were constructed as an open hole however, if the bedrock demonstrated highly fractured conditions, a PVC-screen was installed in the bedrock hole to construct the bedrock well.

Groundwater Movement. Hydraulic conductivities (K) were not measured at the site however transmissivities were measured in clusters of production wells located approximately one mile southwest of the study area by Camp, Dresser and McKee (CDM) in 1986 and were determined to be approximately 2,900 ft^2/day (CDM, 1986). This value is a good estimate for transmissivities at the site since the production wells are located in lithologies similar to those at the Rocco site. These values are also well within the range of transmissivities published by Gay and Delaney 1980 of 1,400 to 4,000 ft^2/day for stratified glacial sediments in the Shawsheen drainage basin.

SECTION 1.5
SITE VISIT OBSERVATIONS

A site visit to the Rocco Landfill was conducted on May 26, 1995. In attendance were Brian Daly, Engineer, Heather Vick, Hydrogeologist, and Robert Griffin, Engineer, of Metcalf & Eddy, Thomas Carbone, of the Tewksbury Board of Health, and Thomas Mahin, Solid Waste Section Chief of the Massachusetts Department of Environmental Protection. The weather was sunny and warm with only a very mild breeze. Insects at the site, including mosquitos and ticks, were in great abundance.

The site walk-over started at 9:00 am and was completed at 12:30 pm. Initially, workers donned required personal protective equipment and calibrated instruments. Walking from South Street, the workers travelled southeasterly past the on-site residence, the former site maintenance building and soil recycling area, and towards the larger of the two waste piles, typically referred to as the northern landfill. Workers then travelled along existing site access roads past the future location of monitoring well 7, then well 6 and then along the wetlands between the two lobes of the northern landfill. The site walk proceeded northward, up the landfill embankment, to the top, and then downhill along an existing access road. The site walk then proceeded southeasterly to the Wilmington town line, and then southwest along the landfill perimeter. Upon reaching the existing bridge across the brook to the southern landfill, the workers travelled up onto the top of the southern landfill, and then northwesterly toward the current location of well No. 4. An existing ponded area south of the landfill was examined, and potential work access routes through an adjacent subdivision south of the landfill were also examined. The workers then returned to the northern landfill, travelling past the current location of well No. 5. The stream and wetlands in the vicinity of well No. 5 were observed. The site walk then continued along the south side of the northern landfill, returning to the vicinity of well Nos. 7 and 2.

During the site visit, the following conditions were observed:

1) Condition of Landfill Surface

The landfill surface was generally sparsely vegetated. Some portions, particularly along the south side of the northern landfill, exhibited methane stressed or dead vegetation. Shrubbery

and small trees existed to a maximum height of about 10 feet on the landfill proper. The southern landfill was better vegetated than the new landfill, with grasses over much of the top of the landfill.

The site was not active.

Stockpiles of dirt existed in the vicinity of future well No.7.

The thickness of the cap, in the majority of the site, appeared thin (less than 4 inches). In much of the northern landfill, waste protruded through the soil cover. The capping resembled only daily cover and not intermediate or final cover.

Erosion of the cover was noticeable in steeper portions of the site, particularly on the northern landfill, and along access roads. For example, the steep slopes around the wetlands of the northern landfill had significant erosion rills, even though this portion of the site also hosted some of the older vegetation on the northern landfill. Overall, however, large areas of exposed waste did not exist, indicating that erosion was generally localized rather than a site wide problem.

2) Surface water runoff patterns

Surface water runoff patterns were as expected based on site topographic mapping. Both landfills are well mounded and significant ponding on top of the waste was not evident. A potential exception to this is the wetlands along the south and northwest side of the northern landfill. If waste exists below those wetlands, this conclusion would change. For the moment, however, no evidence of waste in those wetlands exists.

There are no silt retention basins or similar structures at the landfill.

3) Location of Monitoring Devices

As of the time of the site walk-over, there were no environmental monitoring devices at the site.

4) Leachate breakouts

During the site walkover, leachate staining or discoloration was evident in the watercourse running between the two landfills, as well as along the wetlands at the northern landfill, and along the south slope of the northern landfill. These are also noted on Figure 1.5-1.

5) Evidence of Landfill Gas Emissions

Landfill gas odors were particularly evident along the top of the northern landfill, with the south side of the northern landfill exhausting the strongest odors.

Stressed vegetation existed sporadically throughout the top and side slope surfaces of both landfills, but more so on the northern landfill than the southern landfill. The south side of the northern landfill showed the most severe stressed vegetation.

There were no gas monitoring points or venting systems at the site.

6) Surface Water

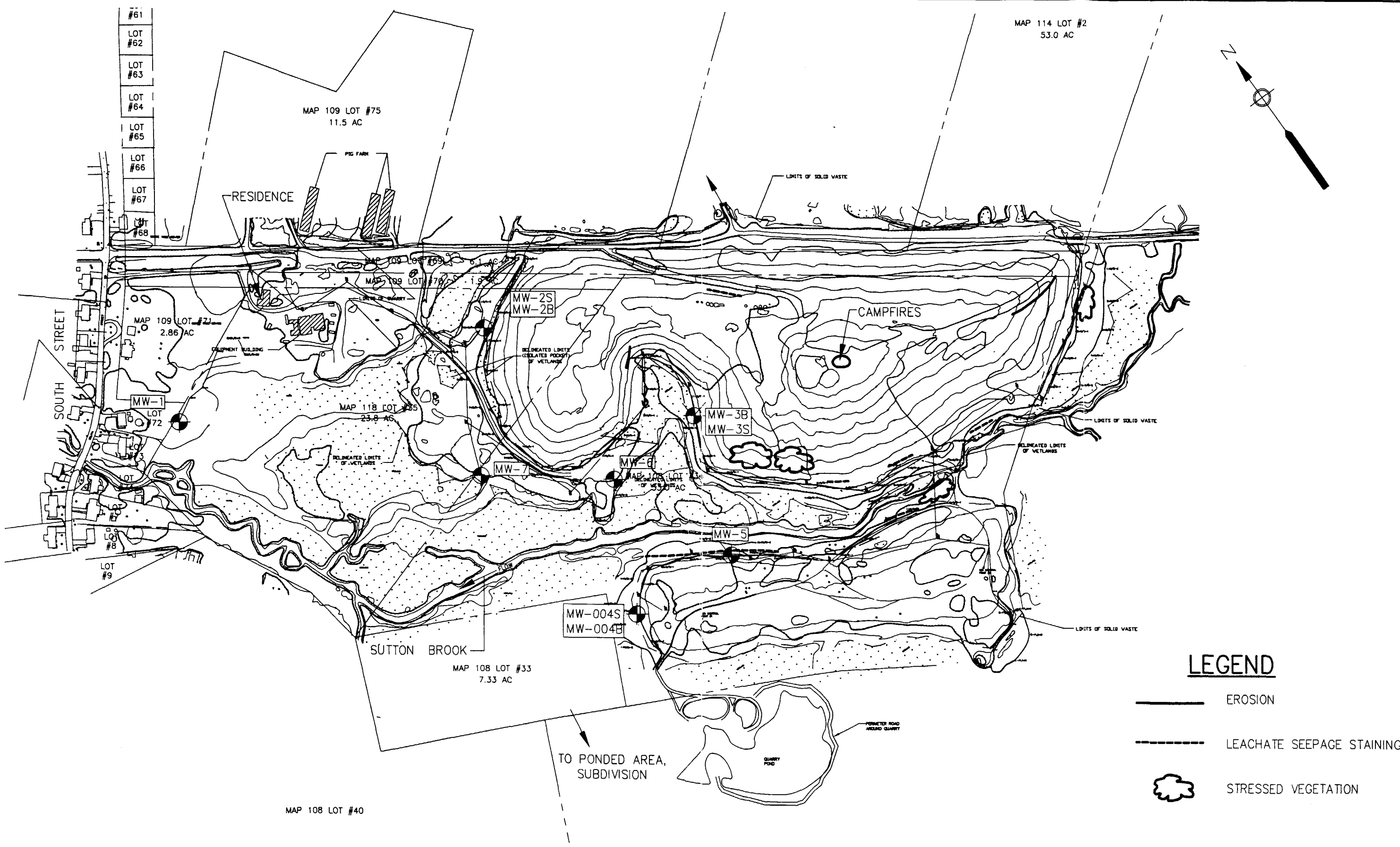
Surface water existed as depicted on the site mapping. Substantial staining of the watercourse between the two landfills is evident. Oily sheens were not evident, except to a small extent at the location of the bridge between the two landfills.

7) Neighboring Land Uses

Neighboring land uses are primarily residential, particularly to the south and west of the landfill. To the north a pig farm and wooded area exists, and to the east, a brush processing operation and wooded area exists. Due to access restrictions, the pig farm and brush processing area could not be viewed during the site inspection.

8) Landfill Accessibility

The landfill is not secured. Access exists from the south through a residential subdivision, the road next to the pig farm, and along the residence at the entrance to the site. Evidence of motorcycles and dirt bike activity was observed along both landfills. Evidence of



REFERENCES:

BASE MAP COMPILED BY SEA ENGINEERS, MARCH 1995 FOR THE TOWN OF TEWKSBURY, MA

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FIGURE 1.5-1
CONDITIONS NOTED DURING SITE VISIT, 06/26/95

EPA Region I New England
Superfund Document Management System

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Page # 60

Imagery Cover Sheet
Unscannable Item

Contact the Superfund Records Center to View this Document

Site Name Sutton Brook

Operable Unit

Break Number 1-2

Report or Document Title Rocco Landfill Initial Site Assessment

Date of Item 10-30-1995

Description of Item Site Plan

Number and Type of Item(s) Figure 1.6.1

campfires existed at the top of the northern landfill. Evidence of hunters, such as spent shell casings and skulls of animals mounted on sticks existed on the southern landfill.

9) Local Geology

Bedrock outcrops were not observed on the site. Surficial soils were primarily sands, silty sands and silty gravel. Exposures of stratified drift were noted south of the landfill near the location of a small sand quarry.

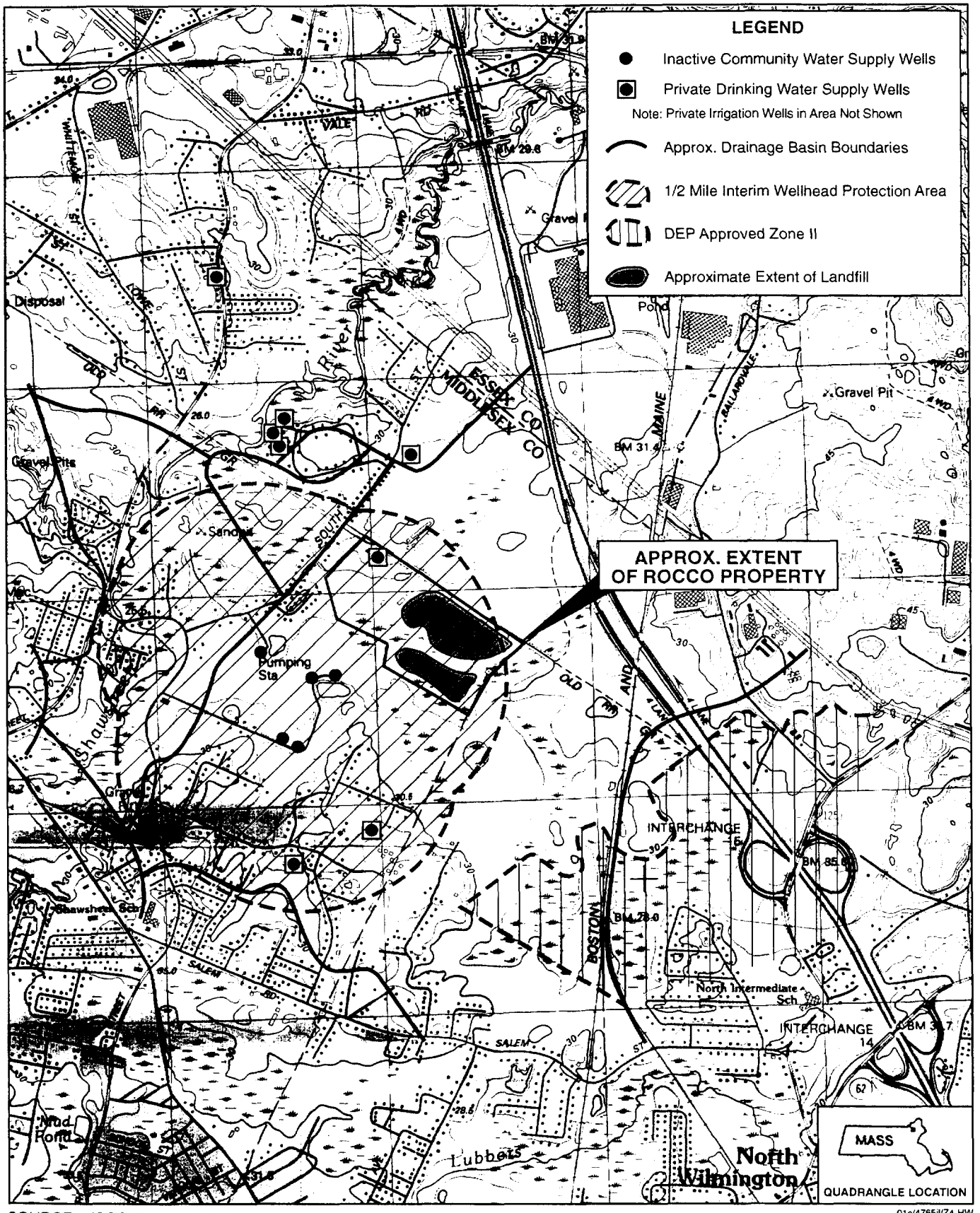
SECTION 1.6
MAPPING

1.6.1 SITE MAPPING

A copy of the most recent site topography map was revised to include approximate monitoring well locations, surface water/sediment sampling locations, soil gas sampling locations, property boundaries, site visit observations, the 100-year floodplain, drainage patterns, and water supply wells within 500 feet of the landfill. This compiled map is enclosed as Figure 1.6-1.

1.6.2 REGIONAL MAPPING

Regional mapping, which is shown on Figure 1.6-2, includes surface water bodies, Areas of Critical Environmental Concern, water supply wells, wellhead protection areas, and drainage basins within one mile of the landfill. Information for this figure was supplied by DEP utilizing the DEP's MassGIS system.



SOURCE: USGS Topographic Map
Reading, MA., 1987

Originals in color.

FIGURE 1.6-2. REGIONAL LOCUS MAP, ROCCO LANDFILL

SECTION 1.7
FIELD SCREENING

1.7.1 FRACTURE TRACE ANALYSIS

A fracture trace analysis was conducted on June 2, 1995 to determine the preferred orientation of brittle fracture traces within available exposed bedrock outcrops. If contamination exists in local groundwater, it may be transported via bedrock fractures which impart a secondary porosity. This study provides rational support for the placement of bedrock groundwater monitoring wells and a basis to speculate the direction of groundwater flow via bedrock fractures in the vicinity of the site.

Bedrock outcrops were found near the Rocco property during a reconnaissance done by M&E in May 1995. In order to characterize site-local bedrock fracture traces for a fracture trace analysis, a geologic map of the Wilmington quadrangle (Castle, 1959) was used to locate possible bedrock outcrops within 0.5 miles of site. Only three of these outcrops were used in the fracture trace analysis because of limited access and dense vegetative cover.

1.7.1.1 Geologic Overview

The site is underlain by the Nashoba Terrane, which is a distinct exotic crustal block that trends northeast-southwest across eastern New England. Bedrock underlying the site vicinity is the Andover Granite, a granitic composition pluton that intruded existing rocks of the Nashoba Terrane in the Ordovician-Silurian.

The Nashoba Terrane is composed of Ordovician aged, mafic volcanic and volcanogenic sedimentary rocks that were polydeformed and metamorphosed from the mid-Ordovician to the Silurian. Widespread plutonism within the terrane included the intrusion of alkaline-granitic and mafic magmas which are thought to have produced heat that likely generated the Andover Granite through the anatexis or remelting of preexisting sedimentary rocks (Hepburn et al., 1993).

The Nashoba Terrane is bordered on the northwest and southeast by two crustal blocks and

separated by faults. On the north, the Clinton-Newbury Fault separates the Nashoba Terrane from the eastern Merrimack Trough, and on the south, the Bloody Bluff Fault separates the Nashoba Terrane from the Avalonian Terrane (Nelson, 1987). According to the bedrock geologic map of Massachusetts (Zen et al., 1983), the presence of a northeast trending fault within the Nashoba Terrane is inferred to be located 0.5 miles west of the site, approximately coincident with the Shawsheen River valley. Other significant structural features in the close proximity of the study area are the Bloody-Bluff Fault, approximately 4.7 miles to the southeast and the Clinton-Newbury Fault, approximately 5.9 miles north, northwest of the site both of which bracket the Nashoba Terrane. The traces of both faults trend northeast-southwest (Nelson, 1987), subparallel to fractures and foliation patterns observed on outcrops within 0.5 miles of the site.

1.7.1.2 Photolineament Analysis

A photolineament analysis was not performed during this effort with the concurrence of the DEP as a result of prohibitive costs to obtain an aerial photograph owned by East Coast Mapping. A photolineament analysis is not possible without the use of the aerial photograph.

1.7.1.3 Results of Joint Mapping and Fracture Trace Analysis

Three outcrop stations were located near the study area to determine the prevalent joint-fracture fabric. The outcrops studied were chosen for their close proximity to the study area and to give the maximum geographic coverage within the shortest amount of time. Other outcrops could not be measured because permission from landowners could not be obtained at the time of the field visit.

All of the rock outcrops examined for the analysis consisted of a biotite-muscovite granite interpreted to be the Andover Granite. The locations of the three stations (labeled 1-3) are shown in Figure 1.7-1.

A total of 21 strike and dip measurements (measuring the attitudes of the joints) were made at the three stations. At each station the outcrop was examined for all possible joint directions. A set of perpendicular control lines was established at each station so that joints

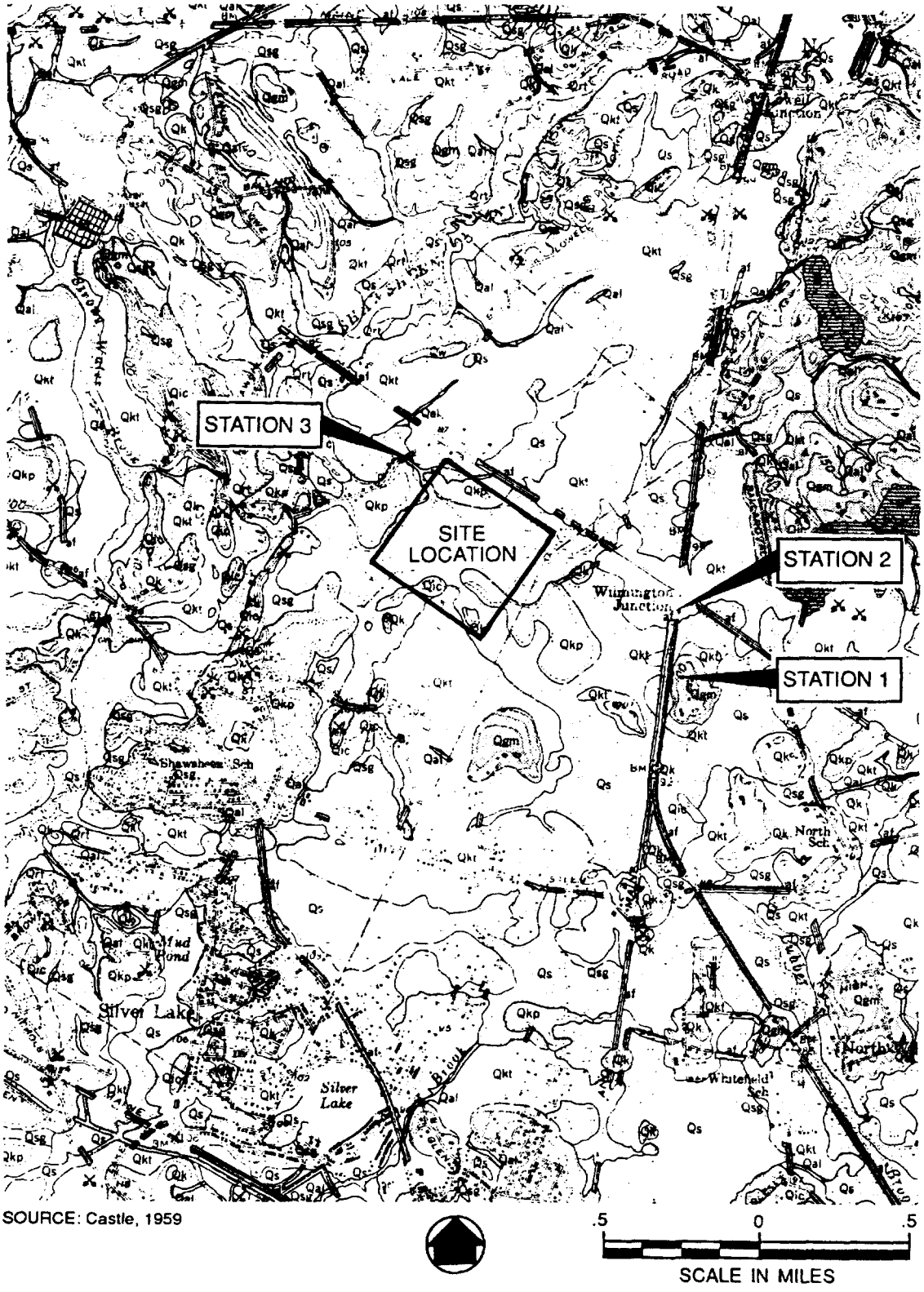


FIGURE 1.7-1. LOCATIONS OF STATIONS USED IN THE FRACTURE TRACE ANAYLSIS OF ROCCO LANDFILL, TEWSKBURY, MASSACHUSETTS

could be measured and mapped. Measurements were taken using a compass to measure the direction of strike, and an inclinometer to measure the joints' deviation from the horizontal.

Station 1 was located 0.6 miles southeast of the study area and station 2 was located 0.5 miles east of the study area, north of station 1. Station 3 was located 0.1 miles west of the study area, along a portion of Sutton Brook east of where it intersects South Street. Access was achieved through residential properties located at 1013 and 1015 South Street.

The strike data were plotted as a histogram (Figure 1.7-2) and suggest two distinct joint sets, a primary north-northeast trending set and a secondary set which trends southeast. Both fracture set directions were present at stations 2 and 3, but the southeast trending fracture direction was not observed at station 1. At station 1, there were three measurements that were northeast trending, and one measurement that was east-west trending. At station 2, there were three measurements that were northeast trending and two measurements that were southeast trending. At station 3, there were seven measurements that were northeast trending and five measurements that were southeast trending.

At all three stations the north-northeast trending fractures were observed to dip nearly vertically, at angles >70 degrees, either to the northwest or the southeast. The north-northeast trending fractures are massive, on the order of 2.0-7.0 ft. in length, and tend to have smooth, regular surfaces. The fractures ranged in orientation from 10-52 degrees, with a mean of 34.7 ± 11.0. These north-northeast trending fractures may reflect the regional trend of the brittle deformation as seen in the northeast trending Bloody-Bluff and Clinton-Newbury faults.

The southeast trending joint set intersects the northeast trending set at high angles and also dip nearly vertically, at angles >70 degrees to the northeast. The southeast trending fractures are significantly shorter in length (0.5-1.0 ft.) than the north-northeast trending fractures and exposed surfaces tend to be rough and irregular.

The secondary fracture set is southeast trending with an orientation of 112 to 177 degrees and a mean of 149 degrees $\pm$ 21.8. The minor fractures occur in small cross strike groups which are often rough and irregular. This secondary set has a weaker preferred orientation than the north-northeast trending set, but in general were observed to be systematic in their occurrence.

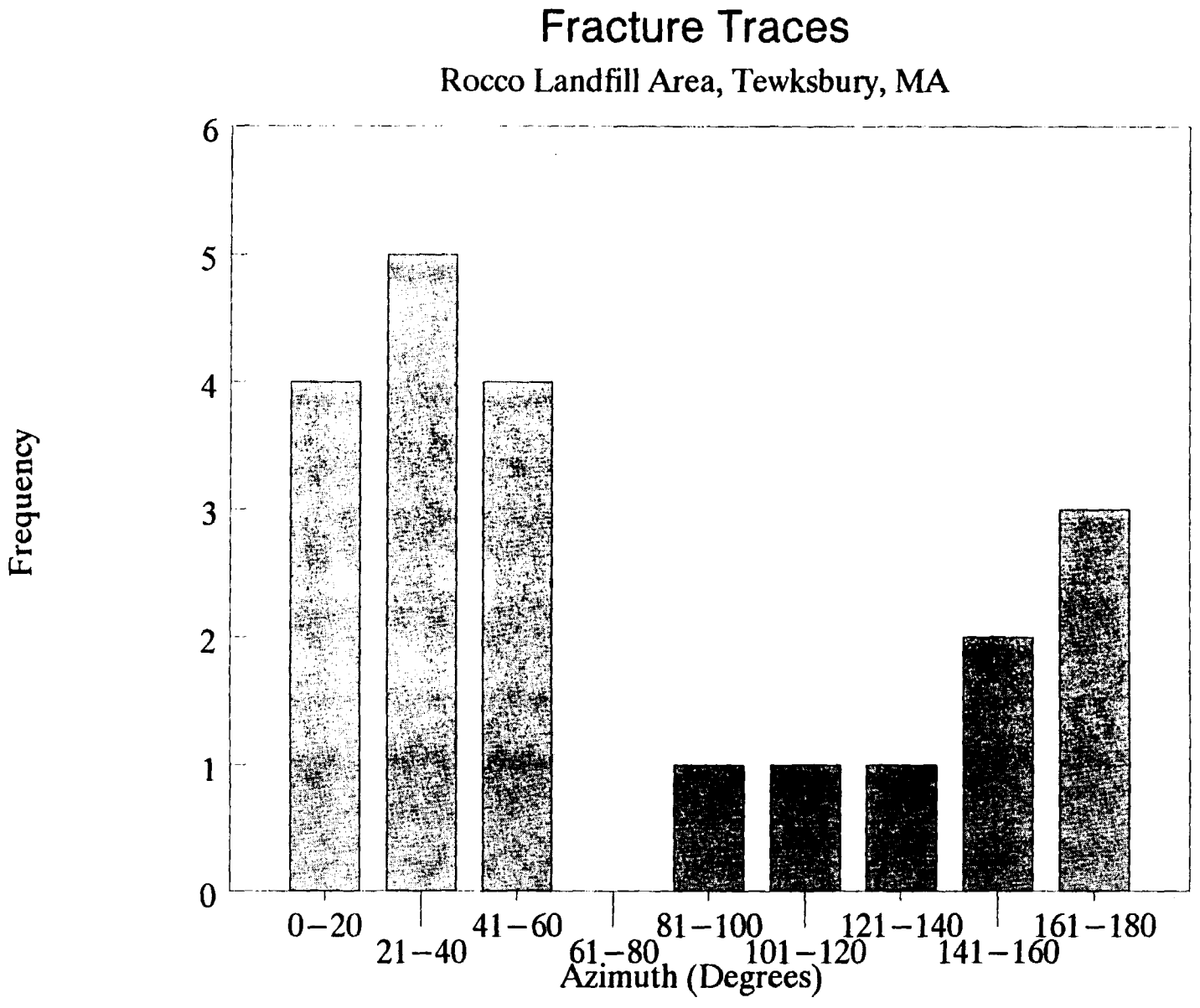


FIGURE 1.7–2. FRACTURE TRACE ANALYSIS HISTOGRAM

1.7.1.4 Fracture Trace Analysis Summary

Brittle fracture data obtained during the fracture trace analysis suggest a preferred northeast-southwest trending fracture direction, with a secondary northwest-southeast trending fracture direction.

The brittle fracture data from the three bedrock stations suggests the potential for northeast-southwest flow. Surface water and shallow groundwater flow at the site is to the west-southwest. Therefore, based on initial groundwater data and the brittle fracture data bedrock obtained during this analysis, bedrock groundwater likely flows in a southwesterly direction.

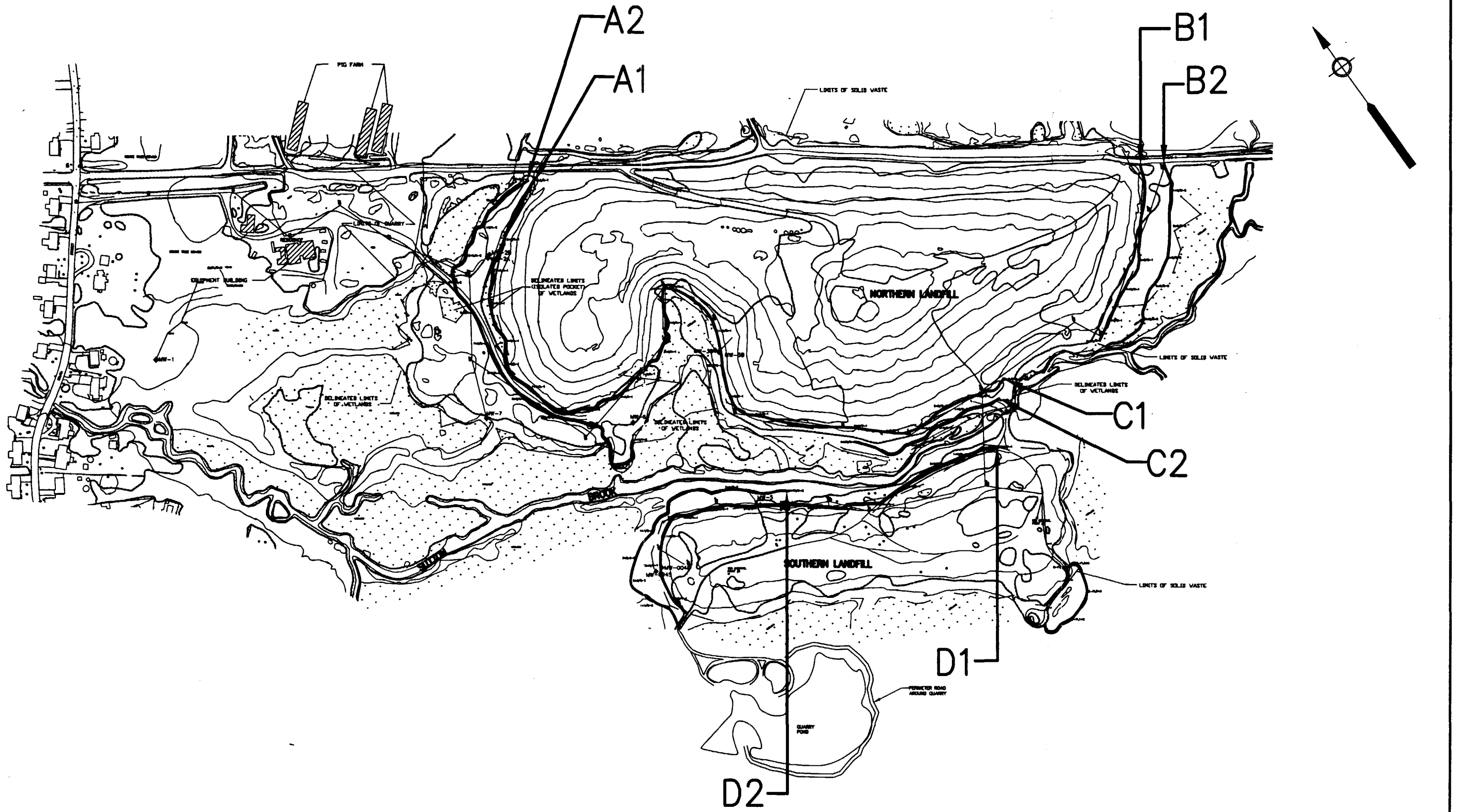
1.7.2 EM SURVEY

An electromagnetic (EM) survey was conducted on June 5, 6 and 9, 1995 around portions of the perimeter of the main (northern) landfilled area (30.3 acres) and the additional (southern) landfilled area (10.3 acres) of the Rocco Landfill in Tewksbury, MA (Figure 1.7-3) by Hager-Richter Geoscience, Inc of Salem, NH under subcontract to Metcalf and Eddy. The electromagnetic method measures the apparent electrical conductivity of subsurface materials. The objective of the EM surveys was to identify areas of elevated terrain conductivity outside the perimeter of the landfilled areas which may be indicative of contaminated groundwater or leachate migrating away from the landfill. The results of the EM survey aided in determining the location of groundwater monitoring wells.

1.7.2.1 Site Conditions

The Rocco Landfill was operated as a private landfill by the Rocco family for over 20 years. The landfill reportedly contains municipal, commercial and industrial waste materials. Although some cover materials have been applied, the landfill is currently uncapped.

Natural materials underlying the site vicinity reportedly consist of Pleistocene-aged kame plain deposits (sand and gravel) and recent swamp deposits consisting of predominantly peat (Castle, 1959). Sutton Brook flows through the site between the southern and northern landfilled areas.



REFERENCES:

BASE MAP COMPILED BY SEA ENGINEERS, MARCH 1995, FOR THE TOWN OF TEWKSBURY, MA

M&E METCALF & EDDY

MA DEPARTMENT OF ENVIRONMENTAL PROTECTION
ROCCO LANDFILL INITIAL SITE ASSESSMENT
FIGURE 1.7-3
EM - SURVEY LINES
JUNE 5, 6 AND 9, 1995

3 - 08-04-93

1.7.2.2 Survey Design and Methodology

The EM surveys consisted profiling along 4 sets of two parallel transects separated by 30 to 50 feet using a Geonics EM31-DL Terrain Conductivity Meter. All profiles were located around the perimeter of portions of each of the landfilled areas. In addition, a single transect was added to the southeast side of the southern landfilled area to make a total of 9 lines in 5 different areas. The lines are designated A1, A2, B1, B2, C1, C2, D1, D2, and E to indicate the area and position with the line located closer to the landfill numbered 1. The total length of the nine lines was 8260 feet. The EM survey transects were planned and projected using a site map which delineated the limits of fill and had been prepared using previous geophysical data (SEA, 1995).

Each of the survey lines was cleared to an approximate minimum width of 3 feet and staked every 100 feet. The EM-31 profiles consist of station measurements being collected every 10 feet. EM-31 data were collected using a Geonics EM-31 terrain conductivity meter. Data were collected at 10-foot intervals along each line in both the horizontal and vertical dipole modes with maximum depths of penetration of approximately 9 feet and 18 feet respectively. EM-31 measures two components of an induced magnetic field. The quadrature phase is a measure of the average terrain conductivity of the subsurface materials located between the receiver and transmitter of the EM31-DL. The inphase component is an indicator of the presence of conductive metal objects but cannot give and exact definition of the object (Hager-Richter, 1995).

The Geonics EM-31 terrain conductivity meter was calibrated according to the manufacturer's instructions. Prior to beginning the EM surveys, background measurements were taken at the start and end of each field day in a wooded area at eastern corner of northern landfill south of access road. Background EM data was collected at regular intervals during the survey and following the survey. The values of apparent conductivity measured along that line were consistently between about 2 and 3 mmho/m and the in-phase data were flat and close to 0 ppt. The EM survey data was reduced and plotted as conductivity vs. distance by Hager-Richter Geoscience Inc. These plots area included in Appendix F.

1.7.2.3 Survey Results

The use of parallel profiles was used in hope of strengthening the interpretation of the data and provide confirmation of the presence of conductive leachate plumes in groundwater. The EM data for most lines are at least in part affected by landfill materials, making the detection of leachate plumes difficult. Regions of elevated conductivity due to conductive plumes might be masked by the effects of the landfill materials. Only lines B2 and E appear to be unaffected by the landfilled waste.

Data from the A1 line suggests groundwater contamination due to the presence of leachate between stations 9+00 and 13+00, on the northwest side of the northern landfill area. The data also suggests that most of the line was run on thin fill, which is supported by field observations. Fill containing metallic objects likely occurs between stations 1+80 and 3+50, and from 8+00 to 9+00.

The first 350 feet of the A2 line were relocated by M&E and re-measured by Hager-Richter at M&E's request on June 9. Data from the revised A2 line indicate that the first 350 feet is on landfill material containing metallic objects. Between stations 5+50 and 11+50 the data suggests the existence of groundwater contamination due to leachate with anomalies occurring near leachate stains. As a result of these interpretations, a monitoring well cluster with an overburden well and a bedrock well (MW-002 S,B) was drilled between lines A1 and A2 at approximately station 9+00 on the A1 line. Specific conductance was measured on sediment samples in the field and values ranged from 77 to 585 mS/cm which suggests the presence of groundwater contamination.

The B1 and B2 lines ran along the east side of the northern landfill area. Data collected on the B1 and B2 line suggests the presence of groundwater contamination due to leachate along the eastern side of the northern landfill. EM data between stations 5+00 and 5+80 on the B1 and B2 lines are elevated suggesting the presence of groundwater contamination due to leachate. Based on the in-phase component, the B2 line is located entirely off the fill.

The C1 and C2 lines ran along the southeastern side of the northern landfill area. The C1 data line suggests the presence of thin fill materials throughout most of the line with metallic objects likely occurring between stations 0+00 and 2+30, 3+70, 5+30, and from 7+40 to 10+20. A broad anomaly interpreted to be groundwater contamination was observed on the

C1 line from station 11+00 to the end of the line (at the western end of the line). Based on the in-phase component of the C2 data, fill is expected to exist between stations 0+00 and 1+30. A monitoring well cluster with an overburden and bedrock well (MW-003 S,B) was drilled near station 1100 on the C1 line, in the section of the line where leachate contamination was suggested by the EM-survey data. Specific conductance measurements were made on sediment samples collected in MW-003 B and range from 19 to 765 mS/cm. Elevated levels of specific conductance in sediment samples also suggests that leachate contamination is present.

The D1 and D2 lines were run along the northern side of the southern landfill area. The D1 data line suggests the presence of fill materials throughout most of the line with metallic objects most likely occurring between stations 0-40 and 4+70. Anomalies interpreted to be due to groundwater contamination were observed between stations 5+00 and 10+00 and at stations 10+50 and 13+00. An overburden monitoring well (MW-005) has been drilled near station 7+50 where the strongest anomalies occurred. In addition, a monitoring well cluster (MW-004 S,B) has been drilled near station 13+00 on the D1 line, along the northwest side of the southern landfill where contamination was indicated by the correlation of elevated terrain conductivity data and observed leachate staining.

Specific conductance measurements were made on sediment samples collected in the MW-004 B, and range from 161-761 mS/cm. Elevated levels of specific conductance in sediment samples also suggests that leachate contamination is present.

The E1 line was run along the southeastern side of the southern landfill area to determine if contamination was migrating off-site to the southeast. The EM-survey data suggests that most of the line is located off fill material. The apparent conductivity data for both dipole orientations were below background levels which suggests that the subsurface at this location has not been affected by landfill leachate.

1.7.3 MONITORING WELL INSTALLATION

Groundwater monitoring wells were installed at the Rocco site to establish groundwater quality and to obtain data necessary to define the hydrogeologic setting. The data was used to assess groundwater flow directions and to define the relationship between overburden and

bedrock groundwater. This section discusses the installation and utilization of groundwater monitoring data used in this ISA.

The groundwater monitoring well installation program was conducted between June 15 and 27, 1995 and included the installation of three monitoring well clusters consisting of one bedrock monitoring well and one overburden monitoring well. Four additional overburden wells were also installed for a total of 10 monitoring wells installed during this program.

Overburden monitoring wells were constructed of 2-inch diameter Schedule 40-PVC well screens (0.010-inch slots) and risers. Bedrock monitoring wells were constructed as 3-inch open-hole wells, if the bedrock was found to be competent. If the bedrock was fractured and an open bedrock hole could not be maintained, the bedrock well was constructed with a 2-inch Schedule 40-PVC well screen (0.010-inch slots). Bedrock-well risers were constructed of HW-steel casing with a grouted annulus to seal off the overburden. Monitoring well installation logs are provided in Appendix B and construction information is summarized in Table 1.7-1. The location of the monitoring wells is shown in Figure 1.6-1. The monitoring wells were located based on the suspected existence of groundwater contamination detected during the EM-survey, the suspected direction of groundwater flow based on topography, and site access.

Three bedrock monitoring wells were installed at the Rocco site as part of monitoring well clusters which also each included one overburden monitoring well. The three monitoring well clusters were located in areas interpreted to be hydrogeologically downgradient of the landfilled areas in order to characterize the geologic and hydrogeologic conditions of the site and to assess the nature and extent of contamination in the aquifer. An additional four overburden monitoring wells were installed in order to determine the horizontal extent of any overburden groundwater contamination at the site.

All of the overburden monitoring wells were screened a minimum of five feet into the water table and were drilled using 4.25-inch hollow stem augers to a maximum depth of 40 feet below ground surface. Bedrock wells were advanced by driving HW-steel casing (4.25-inch ID) through the overburden to a depth of at least two feet into competent bedrock. The HW-casing was then grouted into place and allowed to set for a minimum of 18 hours. A bedrock borehole was advanced 15 to 17 feet into bedrock using a 3.5-inch roller-bit. At MW-002B and MW-003B the bedrock was considered competent enough to construct the

TABLE 1.7–1. MONITORING WELL CONSTRUCTION DETAILS, JUNE 1995

Monitoring Well	Screened Aquifer	Ground Elevation (ft NGVD[1])	Well Bottom Elevation (ft NGVD)	Boring Depth (ft)	Top of Casing Elevation (ft NGVD)	Screened Interval Depth (ft)	Screened Interval Elevation (ft NGVD)
MW–001S	Overburden	80.2	68.2	12	83.00	2.0 – 11.3	78.2 – 68.9
MW–002S	Overburden	83.08	68.08	15	85.58	5.0 – 15.0	75.2 – 65.2
MW–002B	Bedrock	83.03	46.23	36.8	85.88	Open Hole	Open Hole
MW–003S	Overburden	84.58	64.58	20	87.09	9.0 – 19.3	71.2 – 60.9
MW–003B	Bedrock	84.74	33.24	51.5	87.29	Open Hole	Open Hole
MW–004S	Overburden	80.98	54.98	26	83.78	15.0 – 25.3	65.2 – 54.9
MW–004B	Bedrock	80.92	36.92	44	83.62	33.7 – 44.0	46.5 – 36.2
MW–005	Overburden	82.97	50.97	32	85.77	15.0 – 25.0	65.2 – 55.2
MW–006	Overburden	83.44	61.44	22	86.04	5.0 – 15.0	75.2 – 65.2
MW–007	Overburden	80.73	55.73	25	83.78	15.0 – 25.0	65.2 – 55.2

Notes:
[1] NGVD – National Geodetic Vertical Datum

bedrock well as an open hole. At MW-004B, the bedrock was very fractured. Therefore, a PVC-screen was installed to construct the well.

Split spoon samples were collected at the surface and at 5-foot intervals using a 2-foot long, 2-inch OD split barrel sampler in accordance with ASTM D 1586-84. The results of the standard penetration test and lithologic descriptions of split-spoon samples were recorded by an M&E geologist. Soil samples were classified according to the Unified Soil Classification System. At locations where monitoring well clusters were installed, bedrock wells were installed first and split-spoon samples were taken at five-foot intervals in order assess and describe the overburden from ground surface to the top of bedrock. At the three other overburden monitoring well locations, split-spoon samples were taken only until the extent of contamination could be assessed. Cuttings from all borings were containerized in 55-gallon, DOT-approved drums.

Field screening of split-spoon samples was performed to assess the extent of vertical contamination in the overburden. Split-spoon samples were screened using a Photoionization Detector (PID), a conductivity meter and a pH meter. A representative soil sample from each split-spoon was placed in a clean sample jar and a headspace reading was taken. After the headspace reading, deionized water was added to the jar for specific conductance, temperature and pH measurements. Results of the field screening were recorded. The well screen interval of each overburden monitoring well was selected based on the results of the field screening as well as the lithologic conditions encountered.

Monitoring wells were developed after the completion of installation. Overburden monitoring wells were developed using a decontaminated poly-hose that was placed in the well. Purge water was removed using the drilling rig's internal pump. Bedrock wells were developed using a Teflon bailer. Field parameters including specific conductance, temperature and pH were measured and recorded during purging. Wells were purged until a minimum of three well volumes were removed and until all field parameters stabilized to within 10 percent of the previous reading. Purge water from each well was containerized in 55-gallon, DOT-approved drums.

1.7.4 GROUNDWATER SAMPLING AND ANALYSIS

Groundwater samples were collected on June 28, 29 and 30, 1995 from the ten newly installed wells (see Figure 1.6-1) in accordance with Section 4.2.1 of the Initial Site Assessment Work and Cost Plan (M&E, 1995), and the DEP Short Form Field QA/QC dated June 14, 1995, unless otherwise noted. All measurements and observations for each monitoring well were recorded on monitoring well sampling worksheets.

Since the volatile organic analysis of the sample collected from MW-003S was not performed within holding time, the well was sampled again for this parameter on October 30, 1995. MW-001S was also resampled on this day and subsequently analyzed for arsenic.

In this section, an overview of the sampling procedure used for groundwater sampling at the Rocco site, as well as other observations of note relating to specific sampling locations, are provided. Field observations and field measurements are presented. Laboratory results are presented and a summary of the data evaluation is discussed.

1.7.4.1 Field Sampling Procedure

Upon arriving at the well, field personnel noted whether the well was secured or not. The well cap was removed and measurements of groundwater levels and depth of the well were taken. The well volume was calculated from these measurements.

Disposable Teflon bailers provided by the DEP were used for purging the wells and collecting the samples. At least three well volumes were removed from each monitoring well as long as the recovery rate allowed for purging to be completed in a reasonable amount of time. Measurements of pH, temperature, specific conductivity, and dissolved oxygen were taken after each well volume was removed. Purging continued until the water quality parameters had stabilized as much as possible. In the cases where this did not occur in a reasonable amount of time, a minimum of one well volume was removed, and the well was not pumped to dryness. Purge water was placed in 55-gallon drums stationed at each of the monitoring wells.

When purging was complete, samples were collected in the appropriate pre-labeled sampling

containers and were properly preserved. Sampling containers and preservatives were provided by the Wall Experiment Station in Lawrence, Massachusetts. Samples were later tagged, logged on a chain-of-custody form and transported to the appropriate laboratory.

1.7.4.2 Field QA/QC

Disposable Teflon bailers provided by the DEP were used for purging the wells and collecting the samples. Therefore, decontamination of only the water level indicators was necessary. Water level indicators were decontaminated between wells by rinsing with soapy tap water, tap water, and deionized water.

QA/QC samples associated with the ten groundwater samples were collected according to the DEP Short Form Field QA/QC and included three trip blanks (one per cooler of samples for VOC analysis), and one field duplicate (sample MW-903S, collected at MW-003S). Equipment blanks were not collected, as disposable Teflon bailers which do not require decontamination were used for sampling.

1.7.4.3 Field Results

Monitoring well parameters, final readings for all water quality parameters measured, a description of the sample collected, and other observations of note for the June sampling event are presented on Table 1.7-2. In addition, it should also be noted that the following wells did not have sufficient recharge to allow for a minimum of three well volumes to be removed in a reasonable amount of time: MW-200B - 2 well volumes (24.5 gal) removed; MW-003B - 1 well volume (17.1 gal) removed; MW-005 - 2 well volumes (9.1 gal) removed; and MW-006 - 1 well volume (3.5 gal) removed. As per the Initial Site Assessment Work and Cost Plan (M&E, 1995), wells were allowed to recharge after purging prior to collecting samples.

1.7.4.4 Laboratory Analysis

Groundwater samples from each monitoring well were collected along with the associated

TABLE 1.7–2. MONITORING WELL FIELD MEASUREMENTS, JUNE 1995

Monitoring Well	Well Depth [1] (ft)	Depth to Water [1] (ft)	Well Volume (gal)	pH	Conductivity (mS/cm)	Temperature (°C)	Dissolved Oxygen (mg/L)	Sample Charateristics/ Comments
MW–001S	14.30	5.45	1.4	6.1	2.40	11.7	NA [2]	turbid; silty; brown color; earthy odor
MW–002S	17.50	5.76	1.9	6.6	3.66	17.2	2.0	turbid; brown color; leachate odor
MW–002B	39.65	6.24	12.3	7.2	1.82	13.7	3.5	turbid; brown color
MW–003S	22.51	6.99	2.5	6.5	5.27	20.5	4.0	turbid; brown color; leachate odor
MW–003B	54.00	7.18	17.1	8	2.00	20.0	NA	turbid; silty; red–orange color; foaming; leachate odor; slow recharge
MW–004S	28.8	6.23	3.8	6.2	5.92	13.5	3	turbid; silty; orange color; foaming; strong methane/ leachate odor; strong buffering capacity; well gurgling audibly
MW–004B	46.70	6.46	6.5	6.6	3.92	12.7	1.5	clear; colorless; strong methane/leachate odor; slight well gurgling audible
MW–005	34.8	6.00	4.5	6.6	2.60	12.6	NA	silty; tan color; floaters; sheen; foaming; slimy; sulfide odor
MW–006	24.6	7.21	3.5	6.9	1.39	14.0	NA	turbid; silty; sand; lt. brown color
MW–007	28.05	5.64	3.6	6.1	2.69	17.8	2.6	turbid; sheen; foaming; colorless; musty odor

Notes:
[1] Measurements from top of casing.
[2] NA – Not available due to instrument difficulties.

QA/QC samples and submitted for analysis for the following parameters: Volatile Organic Compounds (VOCs) (EPA Method 8260), Semivolatile Organic Compounds (SVOCs) (EPA Method 8270B), Total Metals (EPA Methods 7470A, 7060A, 7740 and 6010A), Cyanide (EPA Method 335.3), PCBs (EPA Method 608), Total Petroleum Hydrocarbons (Standard Method 5520A, E and F), Manganese (EPA Method 6010A), Iron (EPA Method 6010A), Chloride (Standard Method 4500-C1 B), Sulfate (EPA Method 375.4), Total Dissolved Solids (TDS) (Standard Method 2540), Alkalinity (as $CaCO_3$) (Standard Method 2320B), Nitrate as Nitrogen (EPA Method 353.1) and Chemical Oxygen Demand (COD) (Std. Method 5220 B). Samples were submitted to Toxikon Environmental Laboratory in Woburn, Massachusetts for cyanide analysis. All samples for the remaining analyses were submitted to the Wall Experiment Station (DEP) in Lawrence, Massachusetts.

1.7.4.5 Analytical Results

Results from analyses of groundwater samples are presented in Table 1.7-3 (June results), which was provided to Metcalf & Eddy by the DEP, and Table 1.7-3A (October results). The results presented are validated to Tier II as discussed in Section 1.7.4.6. It should be noted that the following analyses were performed by the Wall Experiment Station in addition to those requested by M&E: Specific Conductivity (EPA Method 120.1), and Ammonia - N (EPA Method 350.1). These are also included on the table. The raw data and copies of the chain-of-custody forms are presented in Appendix C.

The data for all analyses performed by the Wall Experiment Station were evaluated by DEP-Woburn at the Tier II level using the EPA Region I Data Validation Guidelines and the 1992 MSCA Quality Assurance Project Plan. The evaluations are presented in two memoranda from Robert Serabian, Quality Assurance Officer, DEP-WES, dated September 12, 1995 (Serabian, 1995a), and December 18, 1995 (Serabian, 1995b), which are presented in Appendix C. M&E also performed a preliminary evaluation of the data, included evaluation of the field duplicate results, and made additional qualifications based upon this evaluation. A summary of these additional qualifications is presented in Appendix C along with the validation memoranda.

Cyanide data from Toxikon were validated at the Tier II level by M&E. The validation is presented in Appendix C.

TABLE 1.7-3. SUMMARY OF GROUNDWATER ANALYSES **Prepared by MA DEP; Edited by M&E**

	Groundwater Sampling Locations											MMCL	Method 1 GW-1[4]
	MW-001S	MW-002S	MW-002B	MW-003S	MW-903	MW-003B	MW-004S	MW-004B	MW-005	MW-006	MW-007		
alkalinity ($CaCO_3$)	24	1,650	72	2,000	1,700	50	2,500	1,400	2,300	430	850	NS	NS
COD	140	370	22	480	580	88	9,300	3,200	8,100	150	600	NS	NS
sp. cond. (μmhos/cm)	265	3,700	185	4,750	4,900	170	7,400	4,500	6,900	1,780	2,500	NS	NS
Total Metals: (mg/l)													
arsenic	**0.127**	**0.790**	0.004	**0.407**	**0.363**	0.042	**0.139**	**1.15**	**0.875**	**0.103**	**0.115**	0.05	0.05
barium	0.16	0.23	0.01	0.28	0.31	0.04	1.6	0.39	1.4	0.26	0.62	2.0	2.0
cadmium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.005	0.005
chromium	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	0.1
copper	0.06	<0.01	<0.01	<0.01	0.03	0.04	0.20	<0.01	0.14	0.05	0.03	1.0[1]	10[3]
iron	62	40	34	24	27	59	758	0.85	430	34	46	0.3[1]	NS
lead	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	<0.05	<0.05	<0.05	<0.05	0.015	0.015
manganese	4.2	3.9	0.43	1.2	1.3	0.70	42	0.74	11	3.9	4.2	0.05[1]	NS
mercury	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.002	0.002
selenium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.05	0.05
silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.10[1]	0.04
zinc	0.34	0.09	0.02	0.17	0.15	0.27	0.23	0.04	0.18	0.25	0.09	5.0[1]	2.0
chloride	49	450	10	600	520	8.0	650	600	650	380	250	250[1]	NS
ammonia-N	NA	134	0.04	NA	NA	NA	204	14	125	42	NA	NS	1[3]
nitrate-N	0.03	0.04	<0.02	0.09	0.09	0.05	0.02	<0.02	0.02	0.07	0.04	10	NS
sulfate	36	60	4.0	2.0	<2.0	8.0	NA	NA	<2.0	8.0	<2.0	250[1]	NS
cyanide	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		

TABLE 1.7-3 (Cont'd). **SUMMARY OF GROUNDWATER ANALYSES** **Prepared by MA DEP; Edited by M&E**

	Groundwater Sampling Locations											MMCL	Method1 GW-1[4]
	MW-001S	MW-002S	MW-002B	MW-003S	MW-903	MW-003B	MW-004S	MW-004B	MW-005	MW-006	MW-007		
VOCs (µg/l)	ND		ND	ND									
methylene chloride				UJ	UJ		**1,900**	**33**	**850**			NS	5
1,1-dichloroethane				UJ	UJ		**290**	**140**	39		**360**	70[2]	70
1,2-dichloroethane				UJ	UJ						3.8	5	5
1,1,1-trichloroethane				UJ	UJ						44	200	200
cis-1,2-dichloroethene		2.8		UJ	UJ		**180**	23	**95**			70	70
trichloroethene				UJ	UJ						2.9	5	5
tetrachloroethene				UJ	UJ						3.4	5	5
vinyl chloride				UJ	UJ						**16**	2	2
chlorofluoromethane				UJ	UJ	**		**	**		12	NS	NS
dichlorofluoromethane				UJ	UJ	**		**	**			NS	NS
trichlorofluoromethane				UJ	UJ		150	27	18			NS	10,000[3]
chloroform				UJ	UJ			1.4	4.9	1.7		5[2]	5
benzene				UJ	UJ						**8.4**	5	5
toluene		29		UJ	54J		**2,000**	**1,300**	900	79	**1,500**	1,000	1,000
ethylbenzene		3.3		UJ	26J		160	190	140	4.7	620	700	700
xylenes		7.9		UJ	61J		240	350	215	16	1,300	10,000	10,000
isopropylbenzene		3.5		UJ	UJ		8.5	16	5.5	0.75		NS	10,000[3]
n-propylbenzene		1.3		UJ	UJ		11	16	3.3		46	NS	1,000[3]
1,2,4-trimethylbenzene				UJ	19J		39	74	17		**320**	NS	100[3]
sec-butylbenzene				UJ	UJ			5.4				NS	NS
n-butylbenzene				UJ	UJ				0.53			NS	NS

TABLE 1.7-3 (Cont'd). SUMMARY OF GROUNDWATER ANALYSES

Prepared by MA DEP; Edited by M&E

	Groundwater Sampling Locations											MMCL	Method1 GW-1[4]
	MW-001S	MW-002S	MW-002B	MW-003S	MW-903	MW-003B	MW-004S	MW-004B	MW-005	MW-006	MW-007		
ABNs (Method 8270B):	ND #	ND	ND			ND	†	#	†	ND‡			
naphthalene				18	19						6.3	NS	20
phenol	UJ						1,400	UJ	1,200		15	NS	4,000
diethyl phthalate								38				NS	6,000
PCBs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0005	0.0005

NOTES:

[1] = Secondary Maximum Contaminant Level (SMCL).
[2] = Massachusetts Drinking Water Guideline.
[3] = No MCP Method 1, GW-1. Reportable Concentration for GW-1 presented.
[4] = As defined by 310 CMR 40.0000 "Massachusetts Contingency Plan" (MCP).
Bold = Concentration greater than Method 1, GW-1.
ND = Not detected above Method Detection Limit.
UJ = The result is not detected and is qualified as estimated for reason(s) identified during data validation.
J = The result is qualified as estimated for reasons(s) identified during data validation.
NS = No Standard.
NA = Not analyzed for the parameter.
For VOCs and SVOCs, only compounds detected are presented.
= Phenolic results are qualified as estimated for reason(s) identified during data validation.
** = Freon. Tentative identification of compound. No standard available for quantification.
† = Base/neutral analysis could not be performed for sample.
‡ = No phenol analysis performed for sample.
Samples collected by Metcalf & Eddy on behalf of MA DEP on 6/27-29/95.
Sample MW-903 submitted as field duplicate of MW-003S.

TABLE 1.7-3A. SUMMARY OF ADDITIONAL GROUNDWATER ANALYSES **Prepared by M&E**

	Groundwater Sampling Locations		MMCL	Method1 GW-1[4]
	MW-001S	MW-003S		
Arsenic (mg/l)	0.003	NA	0.05	0.05
VOCs (µg/l)	NA			
benzene		7.2	5	5
toluene		0.53	1000	1000
xylenes		7.2	10,000	10,000
chlorobenzene		8.1	NS	100
isopropylbenzene		10	NS	10,000[3]
n-propylbenzene		1.6	NS	1000[3]
1,3,5-trimethylbenzene		12	NS	100[3]
1,2,4-trimethylbenzene		1.9	NS	100[3]
1,2-dichlorobenzene		0.79	600	600
naphthalene		19	NS	20

NOTES:

[1] = Secondary Maximum Contaminant Level (SMCL).
[2] = Massachusetts Drinking Water Guideline.
[3] = No MCP Method 1, GW-1. Reportable Concentration for GW-1 presented.
[4] = As defined by 310 CMR 40.0000 "Massachusetts Contingency Plan" (MCP).
Bold = Concentration greater than Method 1, GW-1.
NS = No Standard.
NA = Not analyzed for the parameter.
For VOCs, only compounds detected are presented.
Samples collected by Metcalf & Eddy on behalf of MA DEP on 10/30/95.

The data validation qualifications for analyses performed by the Wall Experiment Station were not included in the data table prepared by the DEP, therefore qualifications based upon the validation memoranda were added by M&E.

1.7.4.6 Data Evaluation

Applicable regulatory criteria are presented along with the results in Tables 1.7-3 and 1.7-3A to assist in data evaluation. Massachusetts Maximum Contaminant Levels (MMCLs) are commonly used to evaluate groundwater where off-site groundwater consumption is a possibility. The Massachusetts Contingency Plan (MCP) identifies groundwater categories which are defined by the potential for exposure (CMR, 1995). The Rocco landfill is within an Interim Wellhead Protection Area, within a Potentially Productive Aquifer, and located within 500 feet of a private water supply well. These facts place the Rocco landfill in groundwater category GW-1. Method 1 risk characterization standards have been listed in the tables for rough evaluation purposes, as the type of risk characterization which could be performed also defines the method used. It should be noted that the presence of contamination at the Rocco landfill site does not necessarily mean that any contaminants detected in off-site water supplies came from the site.

1.7.5 SURFACE WATER AND SEDIMENT SAMPLING

Surface water and sediment samples were collected from three locations (see Figure 1.6-1) in the vicinity of Rocco landfill on June 27, 1995 in accordance with Section 4.2.2 and 4.2.3 of the Initial Site Assessment Work and Cost Plan (M&E, 1995) and the DEP Short Form Field QA/QC dated June 14, 1995, unless otherwise noted. All measurements and observations for each surface water/sediment sampling location were recorded on surface water and sediment sampling worksheets, respectively.

Since the volatile organic analyses for all surface water and sediment samples were not performed within the required holding times, all locations were resampled for this parameter on October 30, 1995, and submitted for volatile organic analysis.

In this section, an overview of the sampling procedure used for surface water and sediment sampling at the Rocco site is provided. Observations of note relating to specific sampling locations, field observations, and field measurements are presented. Laboratory results are presented and a summary of the data evaluation is discussed.

1.7.5.1 Field Sampling Procedure

Surface water and sediment samples were collected starting at the most downstream position and moving upstream in order to minimize the potential for cross contamination between sampling locations. Upon arriving at the sampling location, a sketch and description of the sampling location was made. Water depth, qualitative velocity, odor, color, and clarity were noted.

Surface water samples were collected before the corresponding sediment sample in order to avoid increased turbidity in the surface water sample. Surface water samples were collected from a depth of approximately four inches below the surface. Where the depth of the stream allowed, the appropriate pre-cleaned sample bottle was submerged inverted to the desired depth, then turned over and allowed to fill. VOCs were collected in this manner, however the stream was often too shallow to accommodate the 1-liter sample bottles. Larger sample bottles for the remaining analyses were therefore filled by repeatedly filling a pre-cleaned sample bottle which could be accommodated, and transferring the contents to the appropriate sample container.

Once a surface water sample was collected and properly labelled and preserved, an aliquot of surface water was collected in a disposable container and pH, temperature, and specific conductivity were measured and recorded.

The sediment sample was then collected from the same sampling location. Sediment was collected from depths of 0-6" below the water surface. A trowel was used to fill the VOC containers first with minimal disturbance. Sediment was then collected from a minimum of three points in a cross-section of the stream and placed in a stainless steel bowl. The sediment was then homogenized and placed in the appropriate pre-labeled sample jars.

Sampling containers and preservatives were provided by the Wall Experiment Station in

Lawrence, Massachusetts. Samples were later logged on a chain-of-custody form and transported to the appropriate laboratory.

1.7.5.2 Field QA/QC

Decontamination of soil sampling apparatus was necessary. The stainless steel bowls, spoons, and trowels were washed with soapy tap water, tap water, deionized water, and methanol.

QA/QC samples associated with the three surface water and sediment samples were collected according to the DEP Short Form Field QA/QC, and included one trip blank (one per cooler of samples containing VOCs), and one field duplicate per matrix (surface water sample SW-4 and sediment SD-4 are field duplicates of SW-3 and SED-3, respectively).

1.7.5.3 Field Results

Results for surface water quality measurements as well as sample descriptions and sampling location descriptions are presented for the June sampling event in Table 1.7-4.

1.7.5.4 Laboratory Analysis

Surface water and sediment samples from each sampling location were collected along with the associated QA/QC samples and submitted for analysis for the following parameters: Volatile Organic Compounds (VOCs) (EPA Method 8260), Semivolatile Organic Compounds (SVOCs) (EPA Method 8270B), Total Metals (EPA Methods 7470A, 7060A, 7740, and 6010A), and Cyanide (EPA Method 335.3 for aqueous, EPA Method 9010 for sediment).

In addition surface waters were submitted for analysis for Manganese (EPA Method 6010A), Iron (EPA Method 6010A), Chloride (Standard Method 4500-C1 B), Sulfate (EPA Method 375.4), Total Dissolved Solids (TDS) (Standard Method 2540), Alkalinity (as $CaCO_3$) (Standard Method 2320B), Nitrate as Nitrogen (EPA Method 353.1), and Chemical Oxygen Demand (COD) (Standard Method 5220 B). Sediment samples were also submitted for

TABLE 1.7–4. SURFACE WATER AND SEDIMENT FIELD MEASUREMENTS, JUNE 1995

Sampling Location	pH	Conductivity (mS/cm)	Temperature (°C)	Dissolved Oxygen (mg/L)	Approx. Stream Depth	Qualitative Flow Velocity	Sample Description
SW–1	6.4	4.23	21.4	14.0	0–2 ft.	none	clear; faint yellow color; no odor
SD–1	--	--	--	--	--	noticeable	silty sand; dark brown; organic odor
SW–2	6.4	9.13	26.1	3.0	0–1 ft.	~ 1/4 ft/sec	silty; orange–brown color; leachate odor
SD–2	--	--	--	--	--		silty fine sand; black organic; leachate odor
SW–3	6.5	6.60	18.2	2.5	< 6 in.	~ 1 ft/sec	turbid; brown color; leachate odor
SD–3	--	--	--	--	--		course sand/gravel; multicolor; leachate odor

analysis for PCBs (EPA Method 8080), and Total Petroleum Hydrocarbons (Standard Method 5520A, E, and F).

Samples were submitted to Toxikon Environmental Laboratory in Woburn, Massachusetts for cyanide analysis. All samples for the remaining analyses were submitted to the DEP laboratory in Lawrence, Massachusetts.

1.7.5.5 Analytical Results

Results from analyses of surface water samples and sediment samples collected in June are presented in Tables 1.7-5 and 1.7-6, respectively. Results for surface water and sediment samples collected in October are presented in Tables 1.7-5A and 1.7-6A, respectively. The results presented are validated to Tier II as discussed in Section 1.7.5.6. It should be noted that the following analyses were performed on the surface water samples by the Wall Experiment Station in addition to those requested by M&E: Specific Conductivity (EPA Method 120.1), and Ammonia - N (EPA Method 350.1). These results are also included on the table. The raw data and copies of the chain-of-custody forms are included in Appendix C. It should be noted that on June 27, 1995, M&E chain-of-custody forms were filled out by field personnel, but not accepted due to a miscommunication of laboratory requirements for utilizing a specific chain-of-custody form. All subsequent chain-of-custody reporting followed the laboratory's requirements.

The data for all analyses performed by the Wall Experiment Station were evaluated by DEP-Woburn at the Tier II level using the EPA Region I Data Validation Guidelines and the 1992 MSCA Quality Assurance Project Plan. The evaluations are presented in two memoranda from Robert Serabian, Quality Assurance Officer, DEP-WES, dated September 12, 1995 (Serabian, 1995a), and December 18, 1995 (Serabian, 1995b), which are presented in Appendix C. M&E also performed a preliminary evaluation of the data, included evaluation of the field duplicate results, and made additional qualifications based upon this evaluation. A summary of these additional qualifications is presented in Appendix C along with the validation memoranda.

Cyanide data from Toxikon were validated at the Tier II level by M&E. The validation is presented in Appendix C.

TABLE 1.7-5. SUMMARY OF SURFACE WATER ANALYSES **Prepared by MA DEP; Edited by M&E**

	Surface Water Sampling Locations				MMCL	AWQC[3]
	SW-1	SW-2	SW-3	SW-4		
alkalinity (as $CaCO_3$)	33	240	165	165	NS	20
COD	27	97	88	31	NS	NC
sp. cond. (μmhos/cm)	374	818	574	577	NS	NC
TDS	222	422	314	318	500[1]	NC
Total Metals: (mg/l)						
arsenic	0.002	0.049	0.068	0.080	0.05	0.19
barium	0.02	0.10	0.05	0.05	2.0	NC
cadmium	<0.01	<0.01	<0.01	<0.01	0.005	0.0011
chromium	<0.01	<0.01	<0.01	<0.01	0.1	0.21
copper	<0.01	<0.01	<0.01	<0.01	1.0[1]	0.012
iron	9.4	9.4	10	10	0.3[1]	1
lead	<0.05	<0.05	<0.05	<0.05	0.015	0.0032
manganese	0.66	0.66	0.89	0.93	0.05[1]	NC
mercury	<0.0002	<0.0002	<0.0002	<0.0002	0.002	0.000012
selenium	<0.002	<0.002	<0.002	<0.002	0.05	0.005
silver	<0.01	<0.01	<0.01	<0.01	0.10[1]	0.00012
zinc	0.03	<0.01	0.01	<0.01	5.0[1]	0.11
chloride	94	118	88	86	250[1]	0.23
ammonia-N	0.12	25	13	13	NS	NC
nitrate-N	0.34	0.08	0.06	0.06	10	NC
sulfate	22	26	19	21	250[1]	NC
cyanide	0.0171	<0.01	0.0188	0.1260	0.2	0.0052

TABLE 1.7-5 (Cont'd). SUMMARY OF SURFACE WATER ANALYSES Prepared by MA DEP; Edited by M&E

	Surface Water Sampling Locations				MMCL	AWQC
	SW-1	SW-2	SW-3	SW-4		
VOCs (Method 8260): (µg/l)	ND		ND	UJ		
methylene chloride	UJ	15J	UJ	UJ	NS	NC
1,1-dichloroethane	UJ	UJ	UJ	UJ	70[2]	NC
1,2-dichloroethane	UJ	UJ	UJ	UJ	5	20,000
1,1,1-trichloroethane	UJ	58J	UJ	UJ	200	NC
cis-1,2-dichloroethene	UJ	5.2J	UJ	UJ	70	NC
trichloroethene	UJ	3.6J	UJ	UJ	5	21,900
tetrachloroethene	UJ	UJ	UJ	UJ	5	840
vinyl chloride	UJ	UJ	UJ	UJ	2	NC
chlorofluoromethane	UJ	UJ	UJ	UJ	NS	NC
dichlorofluoromethane	UJ	UJ	UJ	UJ	NS	NC
trichlorofluoromethane	UJ	UJ	UJ	UJ	NS	NC
chloroform	UJ	UJ	UJ	UJ	5[2]	1,240
benzene	UJ	2.8J	UJ	UJ	5	NC
toluene	UJ	240J	UJ	44J	1,000	NC
ethylbenzene	UJ	29J	UJ	9.1J	700	NC
xylenes	UJ	54J	UJ	16J	10,000	NC
isopropylbenzene	UJ	3.1J	UJ	1.2J	NS	NC
n-propylbenzene	UJ	3.9J	UJ	1.2J	NS	NC
1,2,4-trimethylbenzene	UJ	UJ	UJ	5.2J	NS	NC
sec-butylbenzene	UJ	UJ	UJ	UJ	NS	NC
n-butylbenzene	UJ	UJ	UJ	UJ	NS	NC
ABNs (Method 8270B):	ND			ND		
naphthalene		1.8			NS	620
phenol		46	1.1J	UJ	NS	2,560
diethyl phthalate					NS	NC

NOTES:

[1] = Secondary Maximum Contaminant Level (SMCL).
[2] = Massachusetts Drinking Water Guideline.
[3] = Aquatic Water Quality Criteria, 1991, Freshwater Chronic Criteria
NC = No Criteria.
ND = Not detected above Method Detection Limit.
NS = No Standard.
NA = Not analyzed for the parameter.
UJ = Result is not detected and is qualified as estimated for reason(s) identified during data validation.
J = Result is estimated for reason(s) identified during data validation.
For EPA Methods 8260 and 8270B, only compounds detected are presented.
Samples collected by Metcalf & Eddy on behalf of MA DEP on 6/27/95.
Sample SW-4 submitted as field duplicate of SW-3.

TABLE 1.7-5A. SUMMARY OF ADDITIONAL SURFACE WATER ANALYSES Prepared by M&E

	Surface Water Sampling Locations				MMCL	AWQC[3]
	SW-1	SW-2	SW-3	SW-4		
VOCs (Method 8260): (µg/l)	ND					
1,1,1-trichloroethane		3.5	0.88	0.90	200	NC
toluene		15	0.85	0.91	1,000	NC
ethylbenzene		1.5			700	NC
xylenes		3.5			10,000	NC
1,2,4-trimethylbenzene		1.1			NS	NC

NOTES:

[1] = Secondary Maximum Contaminant Level (SMCL).
[2] = Massachusetts Drinking Water Guideline.
[3] = Aquatic Water Quality Criteria, 1991, Freshwater Chronic Criteria
NC = No Criteria.
ND = Not detected above Method Detection Limit.
Only compounds detected are presented.
Samples collected by Metcalf & Eddy on behalf of MA DEP on 10/30/95.
Sample SW-4 submitted as field duplicate of SW-3.

TABLE 1.7-6. SUMMARY OF SEDIMENT SAMPLE ANALYSES **Prepared by MA DEP; Edited by M&E**

	Sediment Sampling Locations			
	SED-1	SED-2	SED-3	SED-4
% Solids	80	52	83	83
Metals: (mg/kg)				
arsenic	2.8	82.3	6.48	6.90
barium	<0.01	<0.01	<0.01	<0.01
cadmium	<0.01	<0.01	<0.01	<0.01
chromium	7.7	<0.01	5.9J	10J
copper	7.7	9.8	5.9	5.9
iron	4,650	3,920	5,880	5,800
lead	<0.05	<0.05	<0.05	<0.05
manganese	86	33	75	62
mercury	0.06	0.71	0.16J	0.04J
selenium	<0.002	<0.002	<0.002	<0.002
silver	<0.01	<0.01	<0.01	<0.01
zinc	33	12	24	26
cyanide (LES)	<0.02	<0.02	<0.02	<0.02
cyanide (Toxicon)	<0.7	<0.7	1.4J	<0.7UJ
TPH	<45	<45	<45	<45
PCBs	ND	ND	ND	ND
VOCs (Method 8260)	ND[1]	ND[1]	ND[1]	ND[1]
ABNs (Method 8270B)	*	*	*	*

NOTES:

ND = Not detected above Method Detection Limit.
ND[1] = Not detected above Method Detection Limit, and all results are estimated (UJ) for reason(s) identified during data validation.
NA = Not analyzed for the parameter.
* Samples not analyzed due to significant sample matrix interference.
Results are presented on a wet weight basis.
Samples collected by Metcalf & Eddy on behalf of MA DEP on 6/27/95.
Sample SED-4 submitted as field duplicate of SED-3.

TABLE 1.7-6A. SUMMARY OF ADDITIONAL SEDIMENT SAMPLE ANALYSES **Prepared by MA DEP; Edited by M&E**

	Sediment Sampling Locations			
	SED-1	SED-2	SED-3	SED-4
% Solids	77	21	77	82
VOCs (Method 8260) (ug/Kg)		ND		
Methylene Chloride	28		24	36

NOTES:

ND = Not detected above Method Detection Limit.
Samples collected by Metcalf & Eddy on behalf of MA DEP on 10/30/95.
Results are presented on a wet weight basis.
Sample SED-4 submitted as field duplicate of SED-3.

The data validation qualifications for analyses performed by the Wall Experiment Station were not included in the data table prepared by the DEP for the June data, therefore qualifications based upon the validation memoranda were added by M&E. In addition to the qualifiers indicated, it should be noted that methylene chloride, the only compound detected in the sediment samples collected in October 1995, is a common laboratory contaminant.

1.7.5.6 Data Evaluation

Applicable regulatory criteria for surface water are presented along with the results in Tables 1.7-5 and 1.7-5A to assist in data evaluation. MMCLs are commonly used to evaluate surface water where off-site groundwater consumption is a possibility. Freshwater chronic Aquatic Water Quality Criteria (AWQC) is also commonly used to evaluate surface water which could potentially be used as drinking water. However, AWQC is only criteria to be used for guidance, while the MMCLs are regulatory standards.

1.7.6 SOIL GAS SAMPLING AND ANALYSIS

Soil gas samples were collected on June 30, 1995 from three locations on the slopes of the landfill (see Figure 1.6-1) in accordance with Section 4.2.4 of the Initial Site Assessment Work and Cost Plan (M&E, 1995), and the DEP Short Form Field QA/QC dated June 14, 1995, unless otherwise noted. All measurements and observations for each landfill gas sampling location were recorded in the field logbook.

This section provides an overview of the sampling procedure used for landfill gas sampling, field observations and field measurements. Laboratory results are also presented and a summary of the data evaluation is discussed.

1.7.6.1 Field Sampling Procedure

Sampling locations were placed on the slopes of the landfill in areas where burned vegetation, visible staining, and/or strong odors were apparent. Samples were obtained from

just below the surface of the landfill using a stainless steel slotted intake point driven into the landfill with a slam bar. An SKC Air Sampling Pump was use to purge the probe until %methane readings as obtained by the Exotector stabilized. Prior to sampling, %methane, %LEL, $\%O_2$, and H_2S were measured using the TMX-410, and recorded.

Samples were collected in pre-labeled Tedlar bags. The bag was placed inside of a 5-gallon plastic tub with two ports. Teflon tubing connected the Tedlar bag to the probe. A second piece of tubing was run from the inside of the tub to the pump. The pump evacuated the tub, causing the Tedlar bag to expand and draw in the landfill gas sample. Sampling time was approximately one minute for each sample. After the sample was collected, final measurements of the above listed parameters were obtained.

Sample bags were kept out of the sun and heat as much as possible. Samples were later logged on a chain-of-custody form, packaged in coolers, and shipped via Federal Express to Ross Analytical Services, Inc., in Strongsville, Ohio.

1.7.6.2 Field QA/QC

Decontamination of the sampling apparatus was necessary between samples. This was achieved by removing all excess soil from the soil probe and purging ambient air through the apparatus for at least one minute.

QA/QC samples associated with landfill gas sampling were collected according to the DEP Short Form Field QA/QC, and included one trip/equipment blank and one field duplicate (sample LFG-4 is a field duplicate of sample LFG-2). The trip/equipment blank was collected by pumping ambient air through the sampling apparatus into the Tedlar bag.

1.7.6.3 Field Results

Final measurements for %methane, H_2S, and O_2 are presented in Table 1.7-7 below.

TABLE 1.7-7. LANDFILL GAS FIELD MEASUREMENTS

Sampling Location	% Methane by Volume	H_2S (ppm)	$\%O_2$ by Volume
LFG-1	36	16	1.2
LFG-2	35	75	0.8
LFG-3	38	12	0.6

1.7.6.4 Laboratory Analysis

The landfill gas samples and associated QA/QC samples were submitted to Ross Analytical Services, Inc., in Strongsville, Ohio, for TO-14 analysis. Upon receipt, the laboratory transferred the samples from the Tedlar bags to SUMMA canisters.

1.7.6.5 Analytical Results

Results for predominant analytes from the TO-14 analysis of the landfill gas samples are provided in Table 1.7-8. The results presented are validated to Tier II. The raw data, data validation, and copies of the chain-of-custody forms are presented in Appendix C.

1.7.6.6 Soil Gas Data Evaluation

The magnitude of detected concentrations for all of the samples was widely scattered. This distribution shows the non-homogeneity of the landfill. However, the data is similar to results from other landfill gas studies referenced in *Air SWAT Results at Several Landfills in Southern California*. (Wilbur, 1989) The SWAT results showed similar levels of toluene, xylenes, chloroethenes and chloroethanes.

Emission levels from 46 landfills provided in *Air Emissions from Municipal Solid Waste Landfills - Background Information for Proposed Standards and Guidelines* (EPA, 1991) showed that 52% contained dichlorodifluoromethane, 67% contained ethylbenzene, 57%

TABLE 1.7–8. SUMMARY OF LANDFILL GAS ANALYSIS, JUNE 1995

	Landfill Gas Sampling Locations				
	LFG–1 (ppbv)	LFG–2 (ppbv)	LFG–3 (ppbv)	LFG–4 [1] (ppbv)	LFG–4 [2] (ppbv)
Methylene Chloride	1,200 U	130 U	88 U	3,800 U [3]	3,600 U [3]
Trichlorofluoromethane	260,000	290	ND	3,500	3,600
1,1–Dichloroethane	390	ND	ND	ND	ND
Dichlorodifluoromethane	210,000	4,300	ND	5,200	4,900
Trichloroethene	970	64 J	ND	ND	ND
Tetrachloroethene	540	320	ND	250	250
Toluene	35,000	7,300	160	5,900	5,500
Chlorobenzene	ND	510	150	400	420
Ethylbenzene	3,600	13,000	220	10,000	9,200
m,p–Xylene	10,000	25,000	780	20,000	18,000
o–Xylene	2,200	5,700	160	4,200	3,800
Total Xylene	12,000	30,000	920	24,000	21,000
1,1,2–Trichloro–1,2,2–trifluoroethane	120	ND	ND	ND	ND
cis–1,2–Dichloroethene	1,300 [3]	ND	ND	ND	ND
1,3,5–Trimethylbenzene	830	4,200	200	1,500	1,700
1,2,4–Trimethylbenzene	1,700	3,700	700	2,700	3,200
1,3–Dichlorobenzene	ND	460	ND	130 J [3]	ND
1,4–Dichlorobenzene	87	ND	230	310	360
1,2,4–Trichlorobenzene	110 J [3]	ND	ND	ND	ND
Acetone	ND	1,900 J	ND	2,600 J	2,500 J

Notes:

[1] Field duplicate of sample LFG–2.

[2] Laboratory replicate of sample LFG–4.

[3] Analyte detected in the diluted analysis only.

– Several tentatively identified compounds included freons, dichlorofluoromethane, dichlorotetrafluoroethene, and various alkanes were detected in all samples at significant concentrations.

– Vinyl chloride was not detected (detection limit ~ 70 ppbv).

ND – Not detected at or above the detection limit.

U – Qualified as not detected due to validation criteria.

J – Qualified as estimated by the laboratory as the concetration is below the detection limit.

contained xylenes, 87% contained toluene and 59% contained trichlorofluoromethane in approximately the same range as detected in the samples for Rocco landfill. This suggests that the compounds detected at the site are typical of municipal solid waste landfill gas.

1.7.7 ESTIMATE OF LANDFILL GAS GENERATION

Landfill gas generation was estimated by applying the Scholl-Canyon model (EMCON, 1980) to the site. This model, and mathematically similar schemes, are widely used in making such estimates. The model requires estimating the volume, density and age of waste in the landfill, a first-order waste decay factor, and the ultimate volume of gas generated by a unit mass of waste.

The volume of the landfill (including cover) was estimated to be approximately 1.9 million cubic yards (cy). This was derived by measuring the area of topographic contour lines within the identified waste limits of the 1995 topographic base plan (SEA, 1995) and assuming a constant base elevation as being the average elevation of the limit of waste (85 ft NGVD). From this volume, 20% was subtracted representing inert cover material, yielding a waste volume of 1.5 million cy. Supporting calculations and further descriptions of assumptions made are provided in Appendix E.

The 1996 methane (CH_4) gas generation rate was calculated to be 34,900,000 ft^3 of CH_4/year. The refuse acceptance rate for the landfill was assumed as steady between 1957 and 1988 at approximately 24,000 tons annually. Kinetic assumptions used in the Scholl-Canyon model included a methane gas generation constant of 0.04 yr^{-1}, a methane generation potential of 3,000 ft^3/ton municipal solid waste (MSW), and an MSW in-place density of 1,000 lb/cy. These values are typical for MSW landfills in climates similar to Rocco's landfill. Although concentrations may vary slightly, typical methane concentrations in landfill gas are 50% by volume. Using this value, the overall LFG generation rate for 1996 would be 69,700,000 ft^3 of LFG/yr. The calculations and assumptions described above are provided in Appendix E.

It should be noted that among similar landfills, gas generation rates and amounts can vary significantly. The actual methane generation rate may vary significantly from these estimates depending on variables such as actual waste acceptance rates, efficiency of prior waste

burning, and ongoing waste degradation rates.

1.7.8 REGULATORY REQUIREMENTS FOR LANDFILL GAS EMISSIONS

On March 12, 1996, the EPA issued new regulations titled "Standards of Performance for Stationary Sources and Guidelines for Control of Existing Sources: Municipal Solid Waste Landfills" (Federal Register, 1996). These regulations provide performance standards for new landfills and emission guidelines for existing landfills.

The Rocco landfill is an existing landfill and therefore subject the Emission Guidelines (EG).

The EG require the collection and control of landfill gas at existing landfills which meet all of the following criteria:

Age: Landfills which accepted waste at any time since November 8, 1987, or have additional design capacity available for future waste.

Capacity: Landfills with a design capacity greater than 2.5 million megagrams (Mg) or 2.5 million cubic meters (m^3). Landfill design capacities may be calculated in either Mg or m^3 for comparison with the exemption limits.

Emission rate: Landfills which exceed an annual non-methane organic compound (NMOC) emission rate of 50 Mg. The NMOC emission rate can be calculated using an EPA model known as a Tier 1 analysis, or by EPA-defined physical testing and analysis procedures known as Tier 2 or Tier 3 analyses.

Landfills that meet these criteria are required to install a LFG collection and control system. The control system must satisfy best developed technology (BDT) requirements. According to the EPA, the BDT for LFG treatment is a flare system or energy recovery system that has been demonstrated to reduce NMOC emissions by 98 weight percent. These criteria are applicable to the Rocco landfill as described below.

1.7.8.1 Age of the Landfill

As described in Section 1.1.5 of this report, the landfill began operation in 1957 as a "burning dump." The site operated as a sanitary landfill in 1961 and accepted municipal, commercial, and industrial waste until closure was ordered in 1979. However, uncontrolled dumping reportedly occurred through 1988 (Adams, 1988). Since the landfill is reported to have accepted waste after November 8, 1987, it would be subject to the emissions rate criteria of the EG provided the other thresholds are satisfied.

1.7.8.2 Estimate of Landfill Volume

The regulations define *design capacity* as "the maximum amount of solid waste a landfill can accept, as specified in the construction or operating permit issued by the State, local, or Tribal agency responsible for regulating the landfill." However, the design capacity of the landfill is unknown because no design plans have been found and the landfill was never issued a construction or operating permit. As described above, the landfill began operations in 1957 and the date for which the landfill stopped accepting waste is unknown, however, uncontrolled dumping reportedly occurred through 1988. For comparison with the design capacity exemption values, the current volume of the landfill was used.

As described in Section 1.7.7, the volume of the landfill was calculated to be 1.9 million cy or 1.4 million m^3. Assuming that the in-place (compacted) density of the solid waste is approximately 1,000 lbs/cy (Tchobanoglous, et al, 1993) the mass of the refuse was calculated to be 0.85 Mg. (See Appendix E)

The estimated landfill volume and mass of refuse are below the threshold values of 2.5 million Mg or 2.5 million m^3. Therefore, the landfill would not be subject to emissions rate criteria of the EG unless future investigations determine that either the actual landfill volume or the landfill mass is higher than the threshold values.

1.7.8.3 Estimate of Non-Methane Organic Compound Emissions

An estimate of NMOC emissions was performed due to a DEP request and for the case that

the design capacity of the site is later found to be above threshold values. This estimate is based on the current waste volume estimate and would likely increase if the landfill volume or design capacity is found to be larger than estimated.

NMOC emissions were estimated using EPA's Tier 1 analysis. The Tier 1 analysis requires that EPA specified (default) values be used in the model to calculate whether the NMOC emission rate is above the regulatory limit of 50 Mg/yr. The Tier 1 analysis uses the following default values for the methane generation potential (L_o), methane generation rate constant (k), and the NMOC concentration (C_{NMOC}):

L_o = 170 m^3 CH_4/Mg;
k = 0.05 yr^{-1}; and
C_{NMOC} = 4,000 ppmv (as hexane).

Using the Tier 1 default values, and the landfill volume and age estimates derived earlier, the current NMOC emission rate was calculated to be 57 Mg/yr, which is above the regulatory limit of 50 Mg/yr (Appendix E).

The Tier 1 default values of k, L_o, and C_{NMOC} are conservative because they were developed for regulatory compliance purposes. As a result, the Tier 1 default values typically overestimate NMOC emissions. Since Rocco's estimated NMOC emission rate of 57 Mg/yr is just over the regulatory limit, a more detailed Tier 2 or Tier 3 analysis appears warranted.

The Tier 2 and 3 analyses are used to determine site-specific default values for the EPA model using EPA-defined physical testing procedures. The Tier 2 and 3 analyses determine site-specific values for C_{NMOC} and k respectively.

The landfill gas sampling for this ISA was performed prior to the promulgation of the EPA NSPS/EG and for purposes other than a Tier 2 characterization. The data does not fully satisfy Tier 2 characterization program requirements. This explains why the 1995 data does not satisfy Tier 2 requirements, such as two (2) samples per hectare from a depth no less than 1 meter below the landfill cover (this would require 34 sampling locations). Equal sample volumes may be composited, but the ability to accurately composite samples depends on the equipment used (i.e. syringes, tedlar bags, summa canisters). Compositing would reduce the number of samples tested in the laboratory. Analysis may be performed using

either EPA Method 25C, a laboratory method, or by EPA Method 18, a field method. There are still uncertainties in the analyte list and guidance documents for Method 18 analysis. This, along with inaccuracies inherent in field methods, is sufficient reason to recommend Method 25C to be used for total NMOC analysis if progressing with Tier 2 evaluation at the site.

For comparison purposes, the NMOC emission rate was calculated using typical values of k and L_o as well as recent site-specific soil gas data. Typical values of L_o and k were based on average values found in various sources. To compare site VOC measurements with NMOCs, it was assumed that the total concentration of VOCs detected in the 1995 TO-14 soil gas samples were 28% of site NMOCs This is a typical value for landfills (EPA, 1995). This yields a site NMOC estimate of approximately 650 ppmv. Table 1.7-9 presents this comparison. The comparison results indicate that the actual NMOC emissions may be significantly less than the regulatory threshold of 50 Mg/yr. Supporting calculations and referenced sources are provided in Appendix E.

To exceed the NMOC threshold value of 50 Mg/yr, C_{NMOC} would have to be greater than 3,500 ppmv. This is approximately 5 times the estimated value using the TO-14 data.

TABLE 1.7-9. NMOC EMISSIONS COMPARISON

CASE	L_o (m^3/Mg)	k (1/yr)	C_{NMOC} (ppmv)	NMOC (Mg/yr)
1. EPA L_o, k and C_{NMOC}	170	0.05	4,000	57
2. EPA L_o and k with C_{NMOC} per 1995 TO-14 results at assumed ratio to NMOCs	170	0.05	645	9
3. Typical values for L_o and k with EPA default C_{NMOC}	93	0.04	4,000	30

1.7.8.4 Landfill Gas Collection/Control

The EG require existing landfills which meet all three criteria (capacity, age and emission rate) to collect and control LFG. The Rocco landfill meets the age criteria and possibly meets the emission rate criteria. The landfill volume appears to be below the design capacity threshold of the NSPS. Therefore, the site is not required under the NSPS to perform collection and control of LFG. There may be other reasons to install such a landfill gas control system at this site. For example, nuisance odors, gas migration or post-closure uses could make such controls appropriate.

SECTION 1.8
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METCALF & EDDY, INC.
30 Harvard Mill Square
Wakefield, MA 01880
(617)-246-5200

SITE LOCATION
Rocco's Landfill ISA
South Street
Tewksbury, MA

BORING NUMBER
MW-002S

CONTRACTOR: New England Boring Corp.
DRILLER: S. Graves
INSPECTOR: B. Buelow
START DATE: 6/16/95
FINISH DATE: 6/16/95

DRILLING METHOD: 4 1/4" HSA
SAMPLING METHOD: 2" Split Spoon
SIZE I.D.: 6"
TOTAL DEPTH: 15.0'

PAGE
1 of 1

Depth	No.	Range	Sampler Blows	Rec. Length	PID* (ppm)	Water Table	Sample Description	Stratigraphic Description
0'								TOPSOIL
						3.3'		
5'							No Samples Taken (see MW-002B log for sample description)	STRATIFIED GLACIAL DRIFT
10'								
15'								
								Bottom of Exploration at 15.0'
20'								
25'								
30'								
35'								

*PID calibrated with isobutylene. To read as benzene, multiply by 0.6.

METCALF & EDDY, INC.	SITE LOCATION	BORING NUMBER
30 Harvard Mill Square Wakefield, MA 01880 (617)–246–5200	Rocco's Landfill ISA South Street Tewksbury, MA	MW–002B

CONTRACTOR: New England Boring Corp.
DRILLER: S. Graves
INSPECTOR: B. Buelow
START DATE: 6/16/95
FINISH DATE: 6/19/95

DRILLING METHOD: 4"Casing, Drive and Wash
SAMPLING METHOD: 2" Split Spoon
SIZE I.D.: 4.5"
TOTAL DEPTH: 36.8'

PAGE 1 of 1

Depth	No.	Range	Sampler Blows	Rec. Length	PID* (ppm)	Water Table	Sample Description	Stratigraphic Description
0'	S–1	0–2'	4–12–14–24	1.9'	ND	3.3'	Black to Dk. Brown silty sand, some c–f gravel, roots	TOPSOIL
5'	S–2	5–7'	11–12–13–12	1.6'	ND		Tannish–Gray, c–f sand, trace silt, saturated	STRATIFIED GLACIAL DRIFT
10'	S–3	10–12'	3–4–5–7	––	ND		Tannish–Gray c–f sand, trace silt	
15'	S–4	15–17'	16–11–10–10	0.6'	ND		Tannish–gray silty fine sand, some coarse sand, trace gravel	
20'			NR					
25'			NR NR NR NR NR					
30'			4 min/ft. 6 min/ft. 4 min/ft. 2 min/ft. 2 min/ft.				Feldspar (50%), Quartz (40%), Bioitite (10%)	GRANITE
35'			2 min/ft. 3 min/ft. 3 min/ft. 7 min/ft. 6 min/ft.				Feldspar (50%), Biotite (30%) Quartz (20%)	GRANODIORITE
			6 min/ft. 3 min/ft.					Bottom of Exploration at 36.8'

*PID calibrated with isobutylene. To read as benzene, multiply by 0.6.

METCALF & EDDY, INC. 30 Harvard Mill Square Wakefield, MA 01880 (617)-246-5200	SITE LOCATION Rocco's Landfill ISA South Street Tewksbury, MA	BORING NUMBER MW-003S

CONTRACTOR: New England Boring Corp.
DRILLER: T. Carpenter
INSPECTOR: R. Bursaw
START DATE: 6/20/95
FINISH DATE: 6/20/95

DRILLING METHOD: 4.25" HSA
SAMPLING METHOD: 2" Split Spoon
SIZE I.D.: 6"
TOTAL DEPTH: 20.0'

PAGE 1 of 1

Depth	No.	Range	Sampler Blows	Rec. Length	PID* (ppm)	Water Table	Sample Description	Stratigraphic Description
0'						2.5'	No Samples Taken (see MW-003B log for sample description)	FILL
5'								
10'								PEAT
15'								STRATIFIED GLACIAL DRIFT
20'								
25'								Bottom of Exploration at 20'
30'								
35'								

*PID calibrated with isobutylene. To read as benzene, multiply by 0.6.

METCALF & EDDY, INC. 30 Harvard Mill Square Wakefield, MA 01880 (617)-246-5200	SITE LOCATION Rocco's Landfill ISA South Street Tewksbury, MA	BORING NUMBER MW-003B

CONTRACTOR: New England Boring Corp.
DRILLER: T. Carpenter
INSPECTOR: R. Bursaw
START DATE: 6/19/95
FINISH DATE: 6/21/95

DRILLING METHOD: 4.25" HSA
SAMPLING METHOD: 2" Split Spoon
SIZE I.D.: 6"
TOTAL DEPTH: 20.0'

Depth	No.	Range	Sampler Blows	Rec. Length	PID* (ppm)	Water Table	Sample Description	Stratigraphic Description
0'	S-1	0-2'	2-2-4-6	1.25'			0-0.5':Brown f sand, trace silt and m sand, dry	
						2.5'	Gray fine sand, trace silt, dry	FILL
5'								
	S-2	5-7'	1-1-1-1	1.0'			5-5.5':Gray f sand, wet	
							5.5-7.0': Brown silty fibrous peat	PEAT
10'								
	S-3	10-12'	12-9-8-7	1.3'			Gray f sand, little to trace m sand, wet	
								STRATIFIED GLACIAL DRIFT
15'	S-4	14.5-16.5'	4-3-4-4	1.1'			Gray f sand, little to trace m sand, wet	
20'	S-5	19.5-21.5'	1-3-8-4	0.5'			Dark gray f sand, little c-m sand and f gravel, wet	
25'	S-6	24.5-26.5'	17-14-12-12	0.5'			Gray silt, little m-f sand trace f gravel, cohesive, wet	GLACIAL TILL
30'	S-7	29.5-31.5'	70-57-24-28	0.83'			Gray silt, little c-f sand, f gravel cohesive, wet	
								DECOMPOSED BEDROCK
35'	S-8	34-35'	29-107	0.58'			Olive-gray decomposed rock consisting of quartz, feldspars with mica and mafic minerals	

*PID calibrated with isobutylene. To read as benzene, multiply by 0.6.

METCALF & EDDY, INC. 30 Harvard Mill Square Wakefield, MA 01880 (617)-246-5200	SITE LOCATION Rocco's Landfill ISA South Street Tewksbury, MA	PAGE 2 of 2	BORING NUMBER MW-003B

Depth	No.	Range	Sampler Blows	Rec. Length	PID* (ppm)	Water Table	Sample Description	Stratigraphic Description
							having a schistose appearance	GRANODIORITE
			4 min/ft				and character	
40'			3 min/ft					
			3 min/ft					
			3 min/ft					
			2 min/ft					
			4 min/ft					
45'			4 min/ft					
			3 min/ft					
			4 min/ft					
			5 min/ft					
			4 min/ft					
50'			2 min/ft					
								Bottom of Exploration at 51.33'
55'								
60'								
65'								
70'								
75'								
80'								

*PID calibrated with isobutylene. To read as benzene, multiply by 0.6.

METCALF & EDDY, INC. 30 Harvard Mill Square Wakefield, MA 01880 (617)-246-5200	SITE LOCATION Rocco's Landfill ISA South Street Tewksbury, MA	BORING NUMBER MW-004S

CONTRACTOR: New England Boring Corp.
DRILLER: T. Carpenter
INSPECTOR: R. Bursaw
START DATE: 6/22/95
FINISH DATE: 6/22/95

DRILLING METHOD: 4.25" HSA
SAMPLING METHOD: 2" Split Spoon
SIZE I.D.: 6"
TOTAL DEPTH: 26.0'

PAGE 1 of 1

Depth	No.	Range	Sampler Blows	Rec. Length	PID* (ppm)	Water Table	Sample Description	Stratigraphic Description
0'							No Samples Taken (see MW-004S log for sample description)	
5'						4.0		STRATIFIED GLACIAL DRIFT
10'								
15'								
20'								
25'								GLACIAL TILL
30'								Bottom of Exploration at 26.0' Note: Methane gas present throughout drilling of borehole
35'								

*PID calibrated with isobutylene. To read as benzene, multiply by 0.6.

METCALF & EDDY, INC.	SITE LOCATION	BORING NUMBER
30 Harvard Mill Square Wakefield, MA 01880 (617)-246-5200	Rocco's Landfill ISA South Street Tewksbury, MA	MW-004B

CONTRACTOR: New England Boring Corp.
DRILLER: T. Carpenter
INSPECTOR: R. Bursaw
START DATE: 6/21/95
FINISH DATE: 6/23/95

DRILLING METHOD: 4" Casing, Drive and Wash
SAMPLING METHOD: 2" Split Spoon
SIZE I.D.: 6"
TOTAL DEPTH: 44.0'

Depth	No.	Range	Sampler Blows	Rec. Length	PID* (ppm)	Water Table	Sample Description	Stratigraphic Description
0'	S-1	0-2'	1-5-8-12	1.75'			0-0.2':Brown f sand, trace silt and root fibers, dry 0.2-2':Gray vf sand, dry	
5'						4.0'		
	S-2	5-7'	7-14-7-7	2.0'			Reddish-brown m-f sand, tr silt, wet Note: at 6.5 ft. Gray vf sand	
10'	S-3	9.5-11.5'	2-4-5-5	1.6'			Gray vf sand, stratified with oxidized seams	STRATIFIED GLACIAL DRIFT
15'	S-4	14.5-16.5'	4-5-5-2	2.0'			Gray vf sand, stratified with oxidized seams	
20'	S-5	19.5-21.5'	3-3-2-5	2.0'			Gray vf sand	
25'	S-6	24.5-26.5'	7-6-10-13	1.5'			Gray silty f sand, little m-c sand, trace f gravel, unsorted matrix, cohesive	GLACIAL TILL
30'	S-6	29.5-29.8'	100/3"	0.1'				
			11 min/ft				Feldspar (50%), Mica (30%), Quartz (20%)	GRANODIORITE
			4 min/ft					
			10 min/ft					
35'			3 min/ft				Note: Roller-bit advances rapidly at 35 ft. weathered zone and/or fracture	
			6 min/ft					
			5 min/ft					

*PID calibrated with isobutylene. To read as benzene, multiply by 0.6.

METCALF & EDDY, INC. 30 Harvard Mill Square Wakefield, MA 01880 (617)–246–5200	SITE LOCATION Rocco's Landfill ISA South Street Tewksbury, MA	PAGE 2 of 2	BORING NUMBER MW–004B

Depth	No.	Range	Sampler Blows	Rec. Length	PID* (ppm)	Water Table	Sample Description	Stratigraphic Description
			15 min/ft				Feldspar (50%), Mica (30%), Quartz (20%)	GRANODIORITE
			10 min/ft					
40'			10 min/ft					
			19 min/ft					
			9 min/ft					
			12 min/ft					
			9 min/ft					
45'								Bottom of Exploration at 44'
50'								
55'								
60'								
65'								
70'								
75'								
80'								

METCALF & EDDY, INC.	SITE LOCATION	BORING NUMBER
30 Harvard Mill Square Wakefield, MA 01880 (617)-246-5200	Rocco's Landfill ISA South Street Tewksbury, MA	MW-005

CONTRACTOR: New England Boring Corp.
DRILLER: S. Graves
INSPECTOR: B. Buelow
START DATE: 6/21/95
FINISH DATE: 6/22/95

DRILLING METHOD: 4.25" HSA
SAMPLING METHOD: 2" Split Spoon
SIZE I.D.: 6"
TOTAL DEPTH: 32.0'

PAGE 1 of 1

Depth	No.	Range	Sampler Blows	Rec. Length	PID* (ppm)	Water Table	Sample Description	Stratigraphic Description
0'	S-1	0-2'	1-2-3-6	1.9'	26.9		0-0.5':Dk. Brown, loamy silt trace f sand	TOPSOIL
						3.0'	0.5-2.0':Tan. m-f sand, trace c sand	
5'								
	S-2	5-7'	5-7-6-7	1.6'	56.7		Tannish-Gray silty f sand	STRATIFIED GLACIAL DRIFT
10'								
	S-3	10-12'	3-4-4-5	1.4'	50.0		Greenish-Gray silty f sand	
15'								
	S-4	15-17'	4-5-16-17	1.2'	34.7		Dense, Gray f sandy silt little f gravel	
20'								
	S-5	20-22'	6-9-6-9	0.6'	23.5'		Greenish-gray silty f sand little clay, trace m-c sand, trace weathered rock	
25'								
	S-6	25-27'	25-24-20-20	0.83	5.8		Tannish-Gray silty c-f sand	GLACIAL TILL
30'								
	S-7	30-32'	31-100/5"	0.4'	7.0		Purple-Gray Mica, Feldspar Quartz	DECOMPOSED BEDROCK
								Bottom of Exploration at 32'
35'								

*PID calibrated with isobutylene. To read as benzene, multiply by 0.6.

METCALF & EDDY, INC.	SITE LOCATION	BORING NUMBER
30 Harvard Mill Square Wakefield, MA 01880 (617)-246-5200	Rocco's Landfill ISA South Street Tewksbury, MA	MW-006

CONTRACTOR: New England Boring Corp.
DRILLER: S. Graves
INSPECTOR: B. Buelow
START DATE: 6/21/95
FINISH DATE: 6/21/95

DRILLING METHOD: 4.25" HSA
SAMPLING METHOD: 2" Split Spoon
SIZE I.D.: 6"
TOTAL DEPTH: 22.0'

PAGE 1 of 1

Depth	No.	Range	Sampler Blows	Rec. Length	PID* (ppm)	Water Table	Sample Description	Stratigraphic Description
0'	S-1	0-2'	1-3-2-2	1.2'	ND		Lt-Dk Brown c-f sand some glass, silt	FILL
5'	S-2	5-7'	2-4-5-7	1.9'	ND		Brown silty c-f sand	STRATIFIED GLACIAL DRIFT
10'	S-3	10-12'	3-4-8-10	2.1'	ND		Brown silty m-f sand, some biotite flakes	
15'	S-4	15-17'	1-2-4-8	1.0'	ND		15-15.5': Brown silty m-f sand 15.5-17':Gray silty f sand, trace clay trace c-m sand	GLACIAL TILL
20'	S-5	20-22.2'	10-6-15-22	1.6'	ND		20-22':Gray silty f sand 22-22.2':Dark Brown-Gray Biotite Mica and Iron Staining	DECOMPOSED BEDROCK
25'								Bottom of Exploration at 22'
30'								
35'								

*PID calibrated with isobutylene. To read as benzene, multiply by 0.6.

METCALF & EDDY, INC.	SITE LOCATION	BORING NUMBER
30 Harvard Mill Square Wakefield, MA 01880 (617)-246-5200	Rocco's Landfill ISA South Street Tewksbury, MA	MW-007

CONTRACTOR: New England Boring Corp.
DRILLER: T. Carpenter
INSPECTOR:B. Buelow
START DATE: 6/26/95
FINISH DATE: 6/26/95

DRILLING METHOD: 4.25" HSA
SAMPLING METHOD: 2" Split Spoon
SIZE I.D.: 6"
TOTAL DEPTH: 25'

PAGE 1 of 1

Depth	No.	Range	Sampler Blows	Rec. Length	PID* (ppm)	Water Table	Sample Description	Stratigraphic Description
0'	S-1	0-2'	4-4-5-9	1.3'	ND		Dk-Lt. Brown silty c-f sand trace brick and gravel	FILL
5'							5-5.5':Dk.-Lt. Brown silty	
	S-2	5-7'	9-11-11-13	1.1	ND	5.0	c-f sand trace brick and gravel	
							5.5-7.0':Gray silty c-f sand	
10'								
	S-3	10-12'	5-10-10-8	0.2'	10		Dk and Lt. Brown silty f sand trace f gravel	STRATIFIED GLACIAL DRIFT
15'								
	S-4	15-17'	2-2-4-4	1.7'	63		Tannish-Gray, silty m-f sand	
20'								
	S-5	20-22'	4-5-4-4	2.1'	ND		Tan, silty f sand	
25'								GLACIAL TILL
	S-6	25-27'	12-13-14-11	1.9'	53		Gray silty f sand, trace clay trace fine gravel	
30'								Bottom of Exploration at 27'
35'								

*PID calibrated with isobutylene. To read as benzene, multiply by 0.6.

Appendix A
Geologic Boring Logs

METCALF & EDDY, INC. 30 Harvard Mill Square Wakefield, MA 01880 (617)-246-5200	SITE LOCATION Rocco's Landfill ISA South Street Tewksbury, MA	BORING NUMBER MW-001

CONTRACTOR: New England Boring Corp.
DRILLER: S. Graves
INSPECTOR: B. Buelow
START DATE: 6/20/95
FINISH DATE: 6/20/95

DRILLING METHOD: 4 1/4" HSA
SAMPLING METHOD: 2" Split Spoon
SIZE I.D.: 6"
TOTAL DEPTH: 12.0'

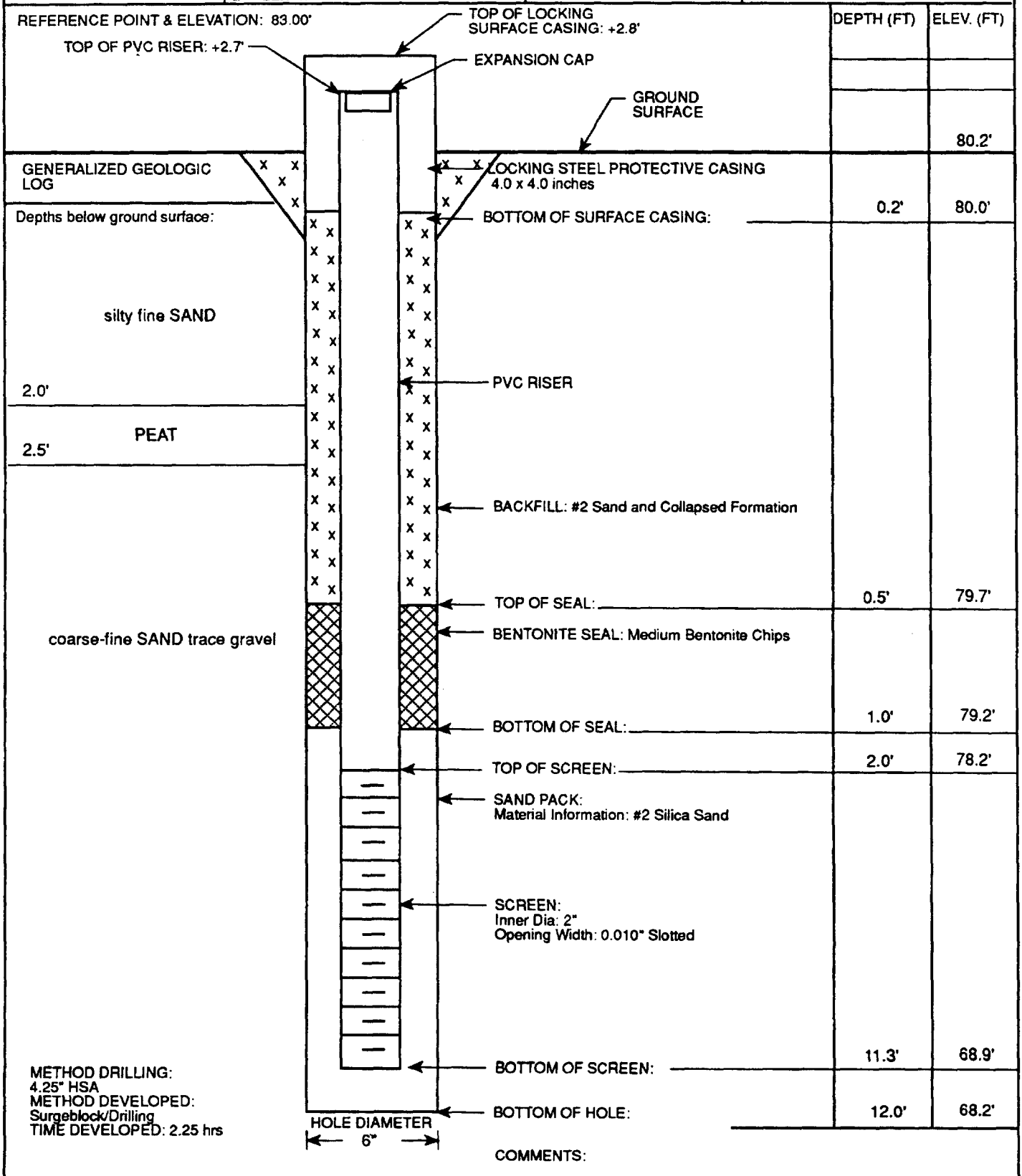
PAGE 1 of 1

Depth	No.	Range	Sampler Blows	Rec. Length	PID* (ppm)	Water Table	Sample Description	Stratigraphic Description
0'	SS-1	0-2'	2-1-1-1	2.1'	1.0		0-0.5':Dark Brown loamy sand, roots,	TOPSOIL/ALLUVIUM
						2.5'	leaves	PEAT
							0.5-1.5':Lt. Brown silty f sand	
							1.5-2.0':Dk. Brown clayey organic silt	
5'							trace peat fibers	
	SS-2	5-7'	6-7-100/0"	1.4'	ND		Tannish Gray silty f sand, little m-c	STRATIFIED GLACIAL DRIFT
							sand, trace gravel	
10'								
	SS-3	10-12'	16-37-47-	2.1'	ND		10-10.5':Tannish-Gray silty f sand	
			120/5"				trace m-c sand	
								Bottom of Exploration at 12.0'
15'								due to auger refusal
20'								
25'								
30'								
35'								

*PID calibrated with isobutylene. To read as benzene, multiply by 0.6.

Appendix B
Monitoring Well Construction Diagrams

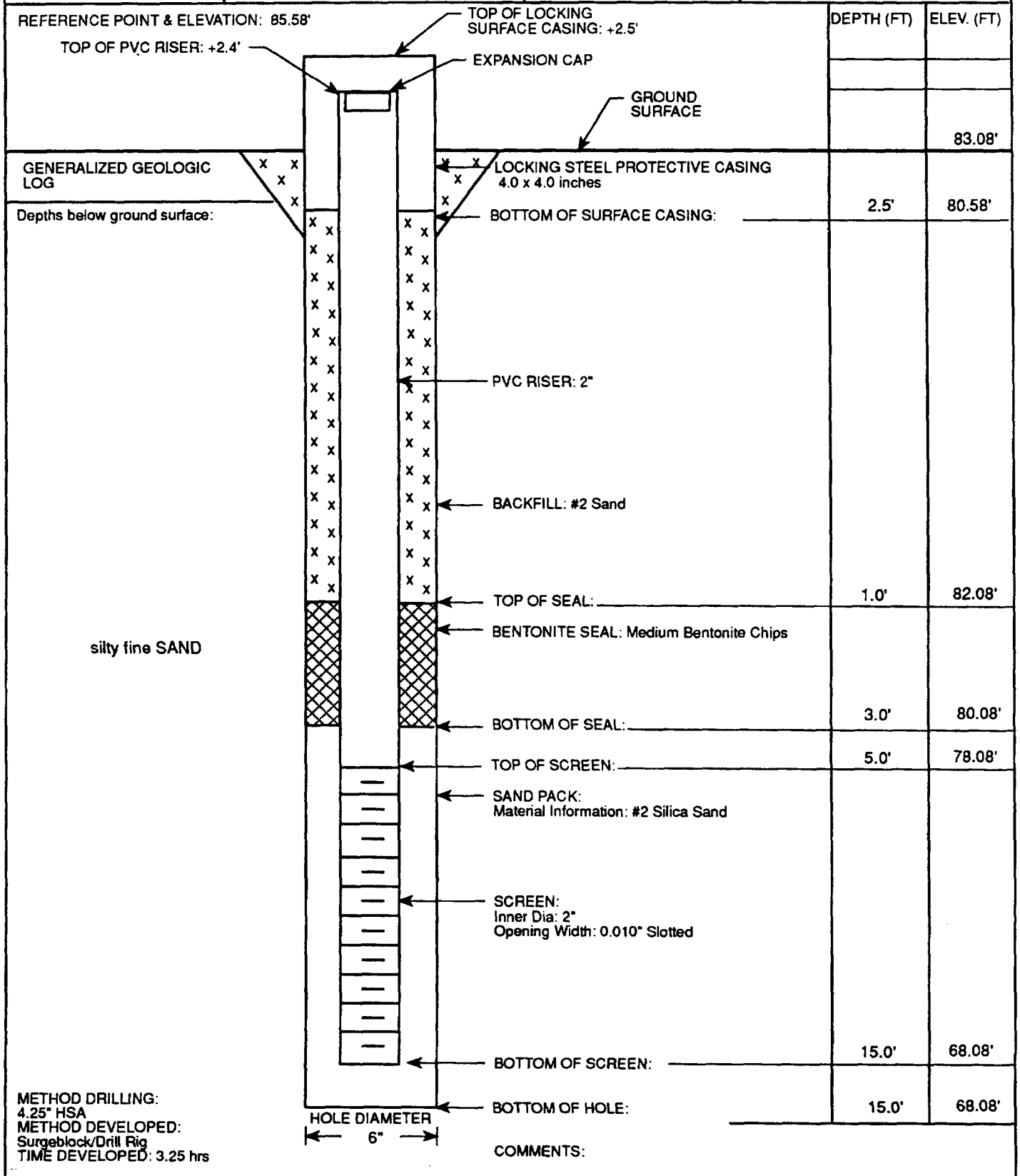
MONITORING WELL CONSTRUCTION	PROJECT: Rocco's Landfill	JOB NO. 017672-0003	WELL NO. MW-001
DRILLING CONTRACTOR: New England Boring	COORDINATES:		
BEGUN: 6/20/95 FINISHED: 6/20/95	SUPERVISOR: B. BUELOW DRILLER: J. GRAVES	WELL SITE: SW Corner of Site	WATER LEVEL:DEPTH/ELEV. 5.45'/77.55'



	DEPTH (FT)	ELEV. (FT)
		80.2'
	0.2'	80.0'
	0.5'	79.7'
	1.0'	79.2'
	2.0'	78.2'
	11.3'	68.9'
	12.0'	68.2'

4719jp

MONITORING WELL CONSTRUCTION	PROJECT: Rocco's Landfill	JOB NO. 017672-0003	WELL NO. MW-002S
DRILLING CONTRACTOR: New England Boring	COORDINATES:		
BEGUN: 6/16/95 FINISHED: 6/16/95	SUPERVISOR: B. BUELOW DRILLER: J. GRAVES	WELL SITE: West of N. Lobe	WATER LEVEL:DEPTH/ELEV. 5.96'/79.62'

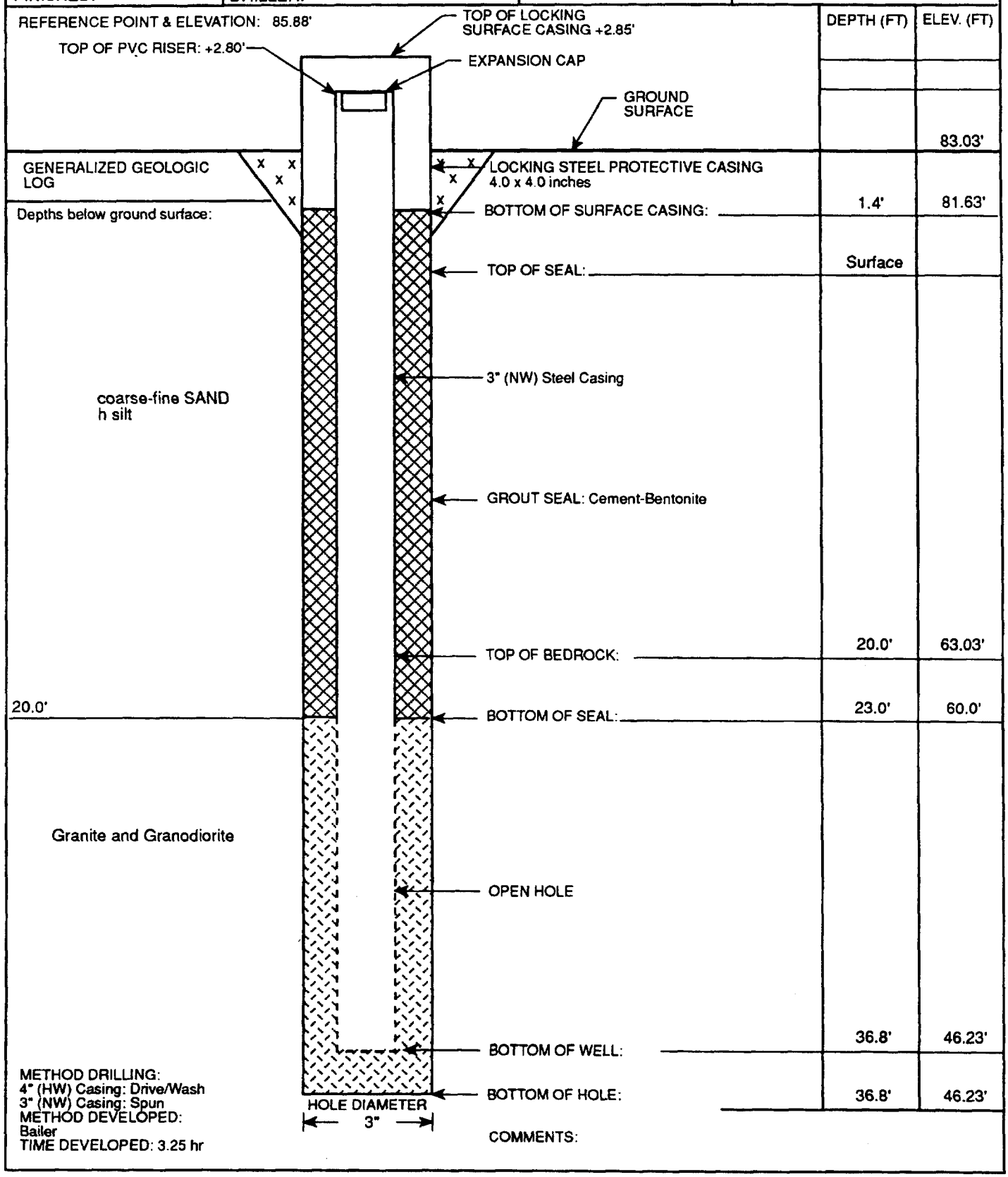


	DEPTH (FT)	ELEV. (FT)
		83.08'
BOTTOM OF SURFACE CASING:	2.5'	80.58'
TOP OF SEAL:	1.0'	82.08'
BOTTOM OF SEAL:	3.0'	80.08'
TOP OF SCREEN:	5.0'	78.08'
BOTTOM OF SCREEN:	15.0'	68.08'
BOTTOM OF HOLE:	15.0'	68.08'

METHOD DRILLING:
4.25" HSA
METHOD DEVELOPED:
Surgeblock/Drill Rig
TIME DEVELOPED: 3.25 hrs

4719p

MONITORING WELL CONSTRUCTION	PROJECT: Rocco's Landfill	JOB NO. 017672-0003	WELL NO. MW-002B
DRILLING CONTRACTOR: New England Boring	COORDINATES:		
BEGUN: 6/16/95 FINISHED: 6/19/95	SUPERVISOR: R. BURSAW DRILLER: S. GRAVES	WELL SITE: West of North Lobe	WATER LEVEL:DEPTH/ELEV. 6.24'/79.64'



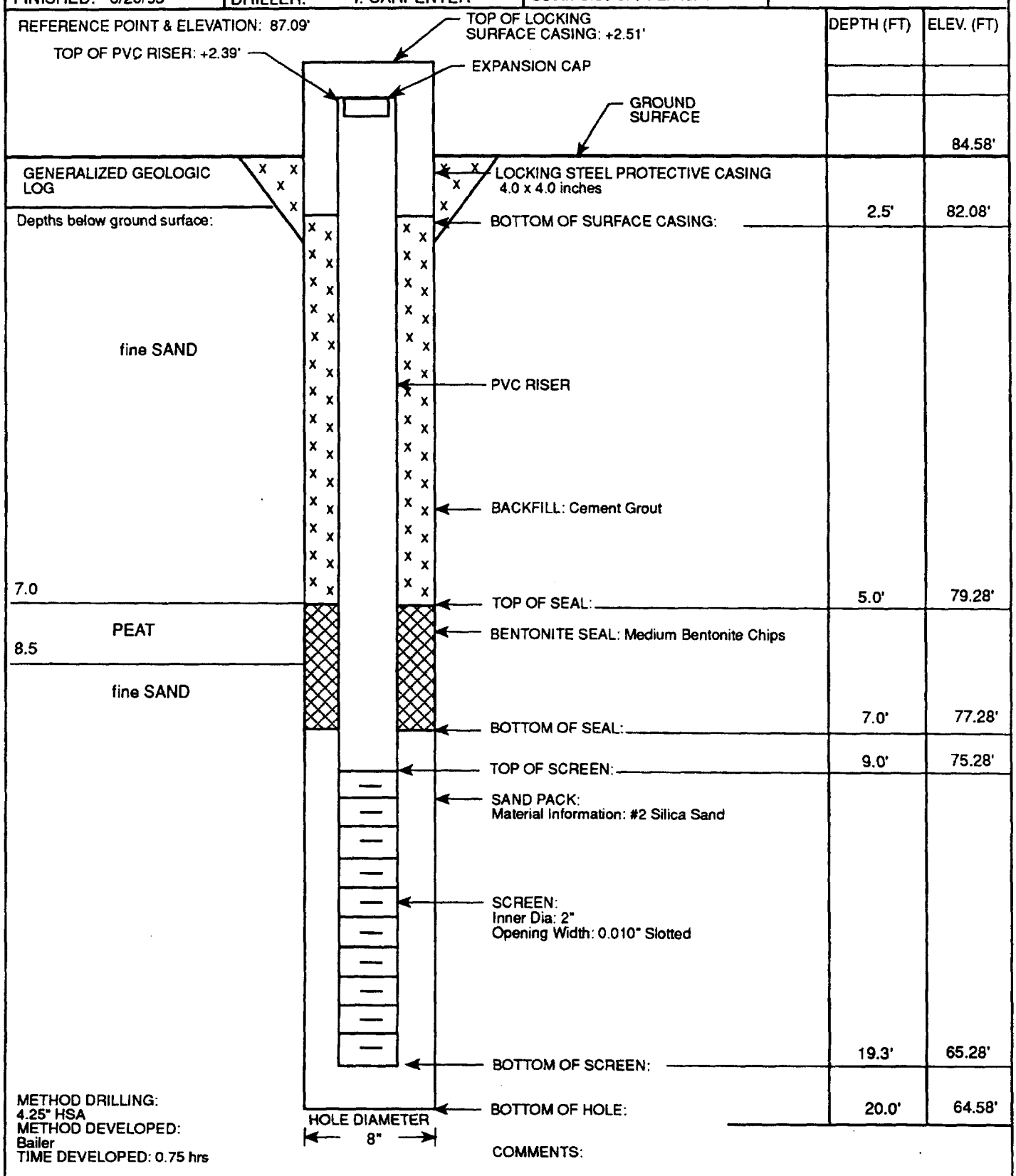
	DEPTH (FT)	ELEV. (FT)
		83.03'
BOTTOM OF SURFACE CASING:	1.4'	81.63'
TOP OF SEAL:	Surface	
TOP OF BEDROCK:	20.0'	63.03'
BOTTOM OF SEAL:	23.0'	60.0'
BOTTOM OF WELL:	36.8'	46.23'
BOTTOM OF HOLE:	36.8'	46.23'

METHOD DRILLING:
4" (HW) Casing: Drive/Wash
3" (NW) Casing: Spun
METHOD DEVELOPED:
Bailer
TIME DEVELOPED: 3.25 hr

COMMENTS:

4719jp

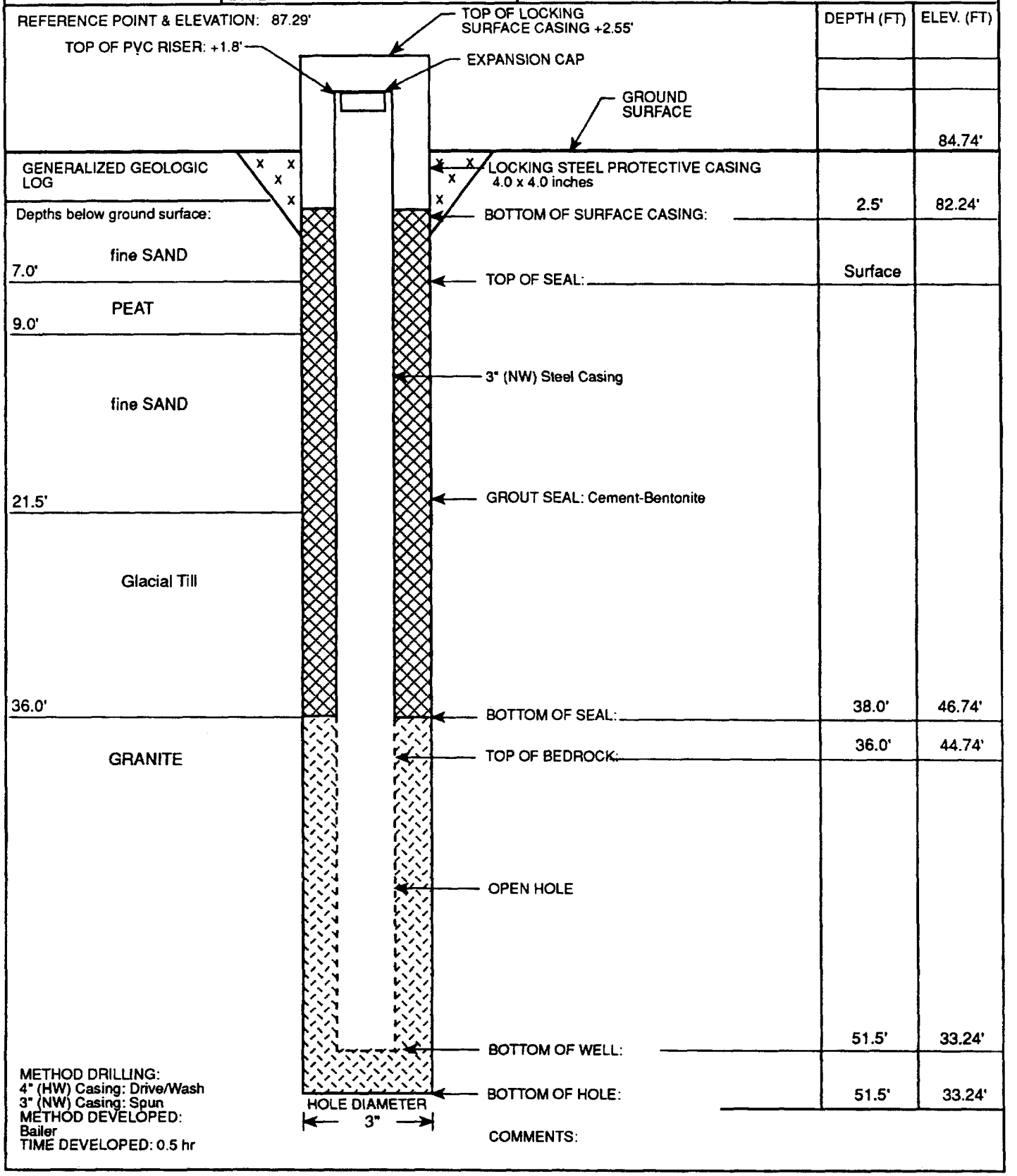
MONITORING WELL CONSTRUCTION	PROJECT: Rocco's Landfill	JOB NO. 017672-0003	WELL NO. MW-003S
DRILLING CONTRACTOR: New England Boring	COORDINATES:		
BEGUN: 6/20/95 FINISHED: 6/20/95	SUPERVISOR: B. BUELOW DRILLER: T. CARPENTER	WELL SITE: South Side of N. Landfill	WATER LEVEL:DEPTH/ELEV. 6.99'/80.10'



DEPTH (FT)	ELEV. (FT)

4719jp

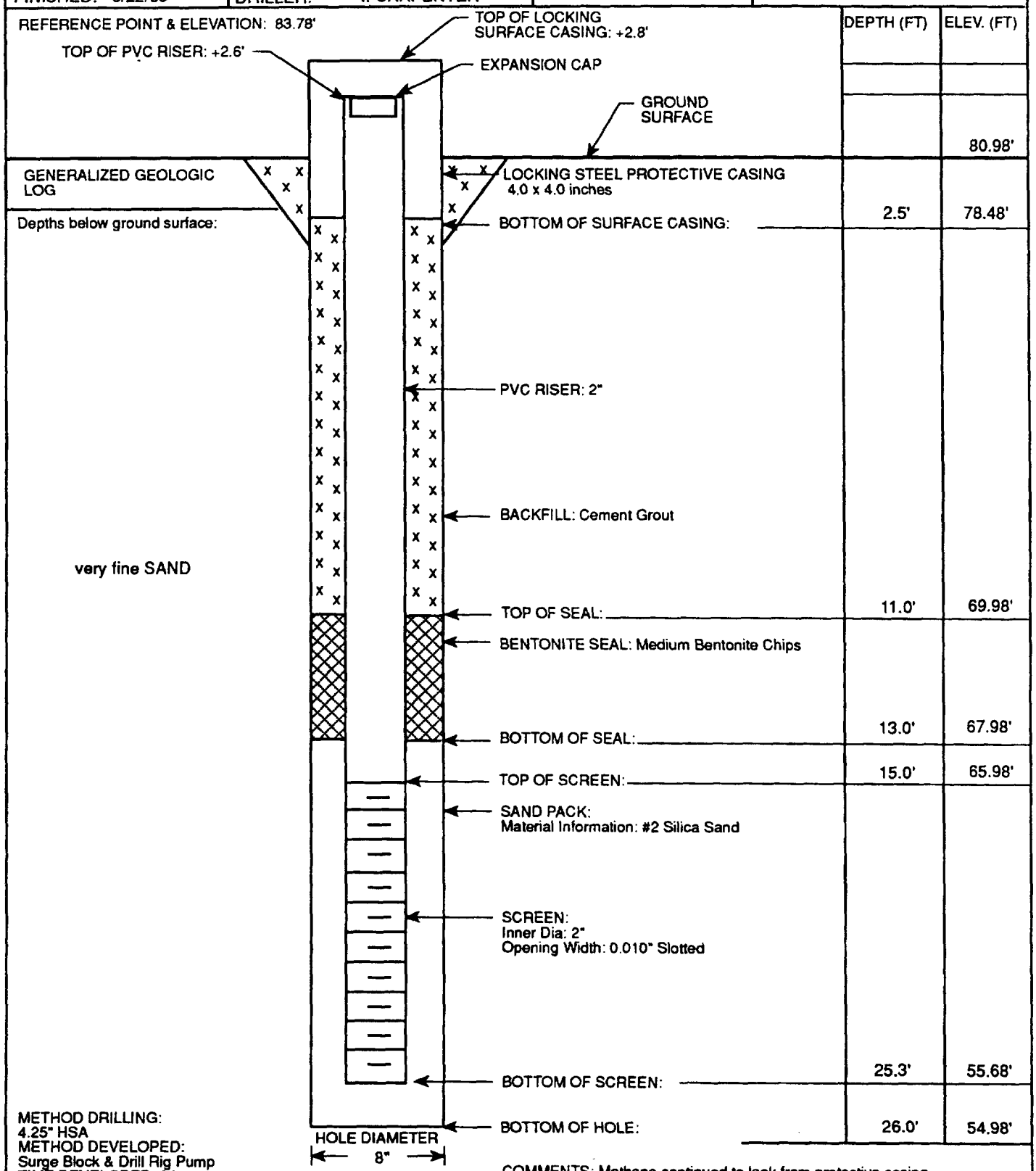
MONITORING WELL CONSTRUCTION	PROJECT: Rocco's Landfill	JOB NO. 017672-0003	WELL NO. MW-003B
DRILLING CONTRACTOR: New England Boring	COORDINATES:		
BEGUN: 6/19/95 FINISHED: 6/21/95	SUPERVISOR: R. BURSAW DRILLER: T. CARPENTER	WELL SITE: South Side of North Landfill	WATER LEVEL:DEPTH/ELEV. 7.18'/80.11'



	DEPTH (FT)	ELEV. (FT)
		84.74'
BOTTOM OF SURFACE CASING:	2.5'	82.24'
TOP OF SEAL:	Surface	
BOTTOM OF SEAL:	38.0'	46.74'
TOP OF BEDROCK:	36.0'	44.74'
BOTTOM OF WELL:	51.5'	33.24'
BOTTOM OF HOLE:	51.5'	33.24'

4719jp

MONITORING WELL CONSTRUCTION	PROJECT: Rocco's Landfill	JOB NO. 017672-0003	WELL NO. MW-004S
DRILLING CONTRACTOR: New England Boring	COORDINATES:		
BEGUN: 6/22/95 FINISHED: 6/22/95	SUPERVISOR: R. BURSAW DRILLER: T. CARPENTER	WELL SITE: NW Side of South Lobe	WATER LEVEL:DEPTH/ELEV. 6.23'/77.55'



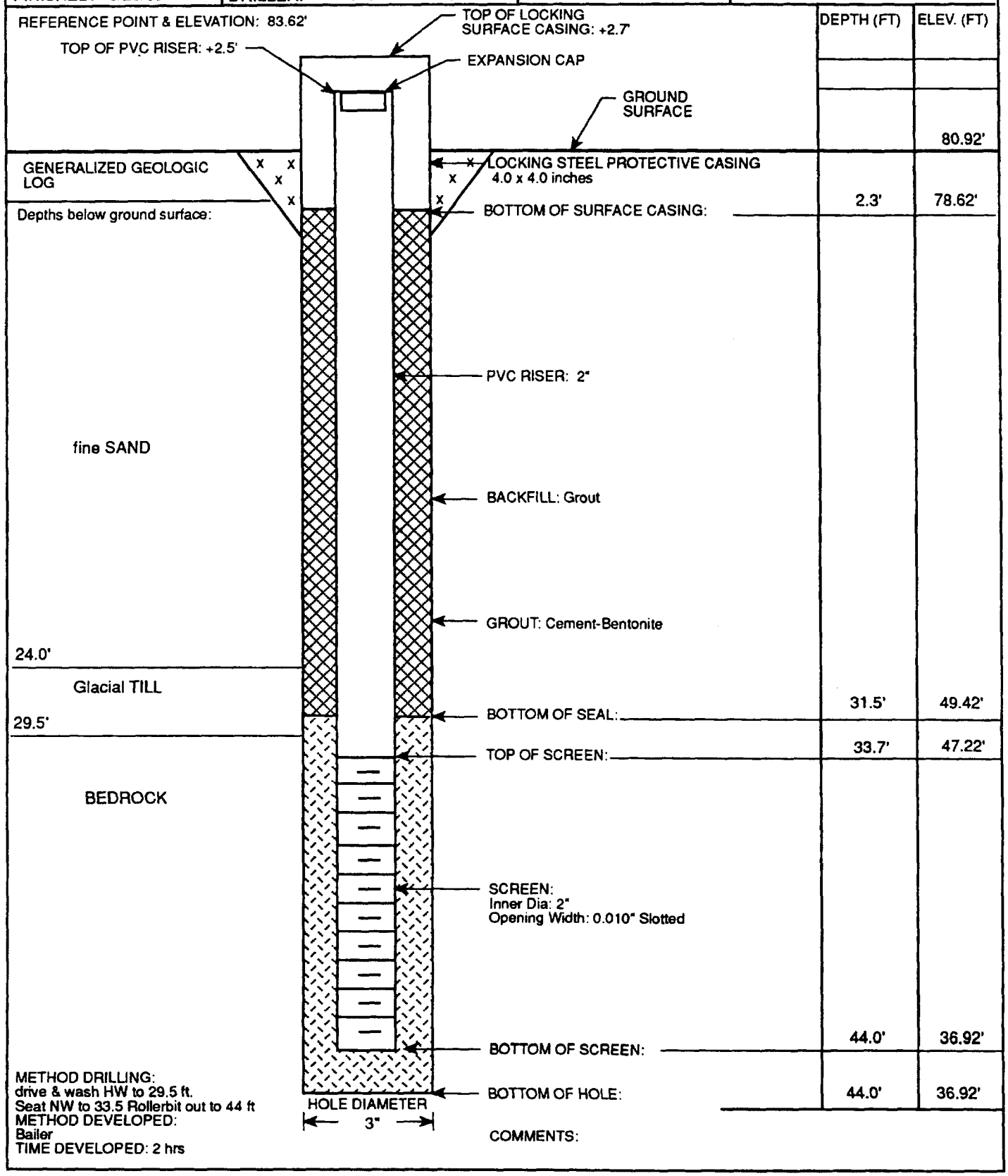
	DEPTH (FT)	ELEV. (FT)
		80.98'
BOTTOM OF SURFACE CASING:	2.5'	78.48'
TOP OF SEAL:	11.0'	69.98'
BOTTOM OF SEAL:	13.0'	67.98'
TOP OF SCREEN:	15.0'	65.98'
BOTTOM OF SCREEN:	25.3'	55.68'
BOTTOM OF HOLE:	26.0'	54.98'

METHOD DRILLING:
4.25" HSA
METHOD DEVELOPED:
Surge Block & Drill Rig Pump
TIME DEVELOPED: 2 hrs

COMMENTS: Methane continued to leak from protective casing - audible gurgling heard from well

4719jp

MONITORING WELL CONSTRUCTION	PROJECT: Rocco's Landfill	JOB NO. 017672-0003	WELL NO. MW-004B
DRILLING CONTRACTOR: New England Boring	COORDINATES:		
BEGUN: 6/21/95 FINISHED: 6/23/95	SUPERVISOR: R. BURSAW DRILLER: T. CARPENTER	WELL SITE: NW Side of South Lobe	WATER LEVEL:DEPTH/ELEV. 6.46'/77.16'



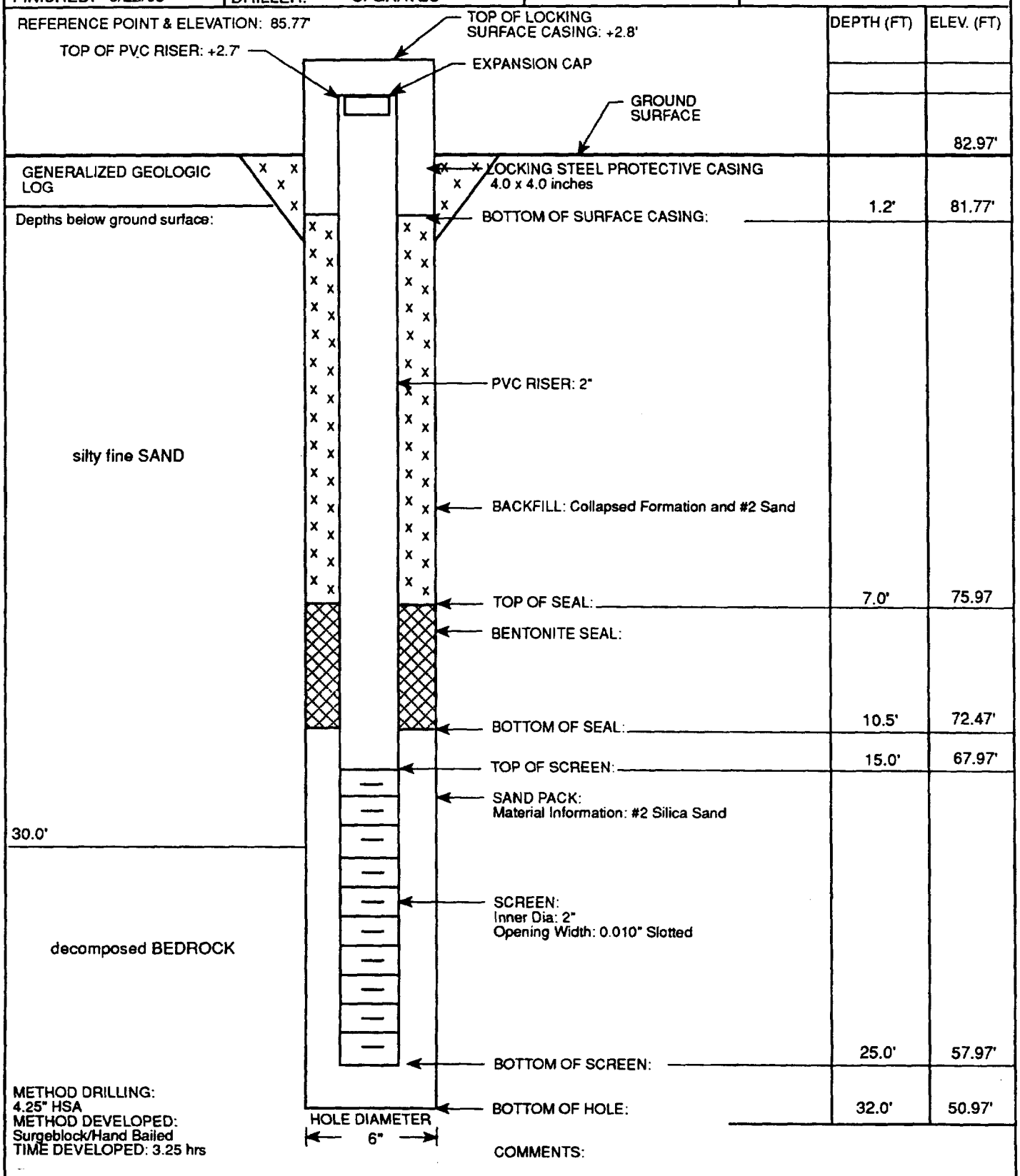
	DEPTH (FT)	ELEV. (FT)
		80.92'
BOTTOM OF SURFACE CASING:	2.3'	78.62'
BOTTOM OF SEAL:	31.5'	49.42'
TOP OF SCREEN:	33.7'	47.22'
BOTTOM OF SCREEN:	44.0'	36.92'
BOTTOM OF HOLE:	44.0'	36.92'

METHOD DRILLING:
drive & wash HW to 29.5 ft.
Seat NW to 33.5 Rollerbit out to 44 ft
METHOD DEVELOPED:
Bailer
TIME DEVELOPED: 2 hrs

COMMENTS:

4719p

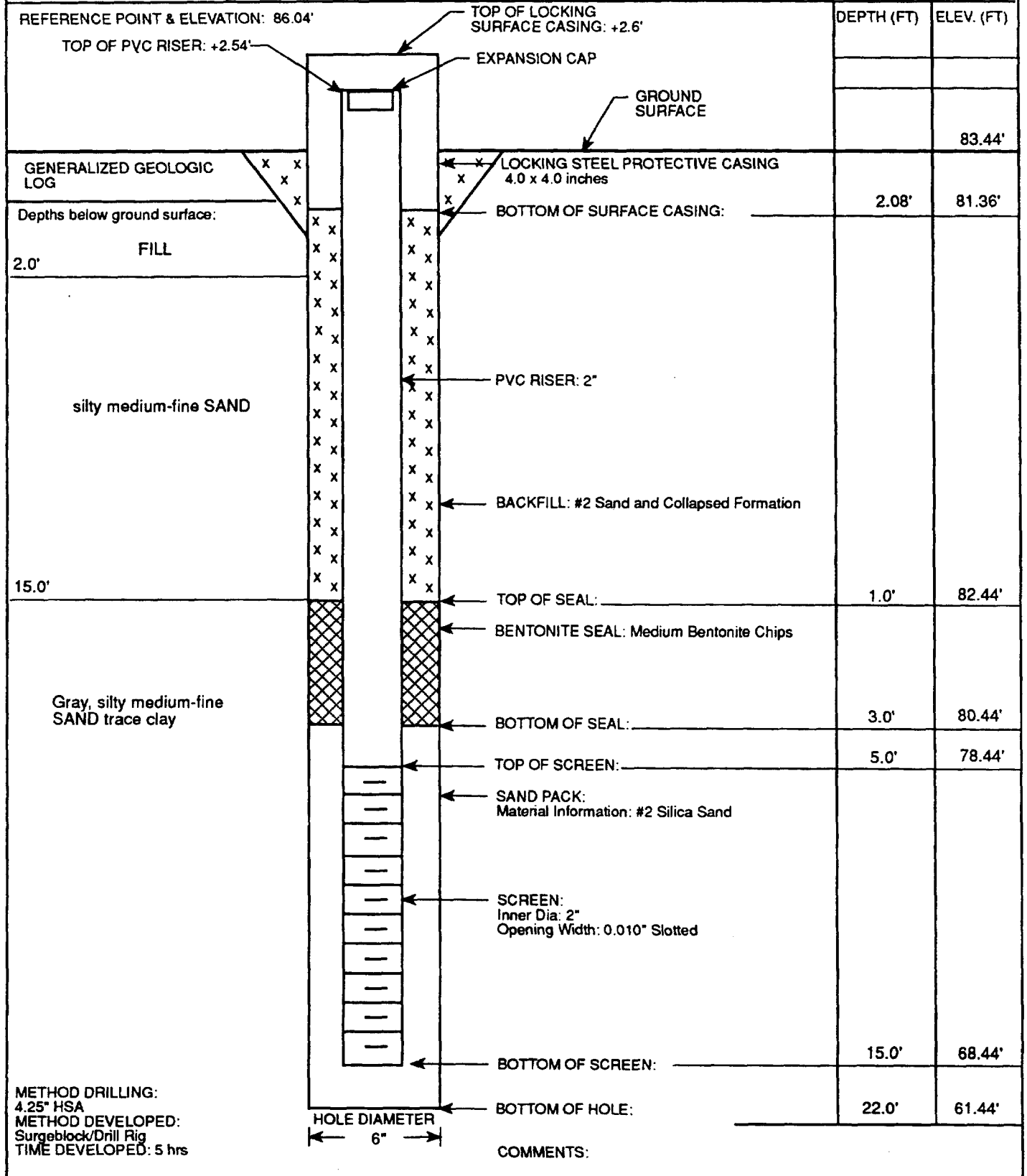
MONITORING WELL CONSTRUCTION	PROJECT: Rocco's Landfill	JOB NO. 017672-0003	WELL NO. MW-005
DRILLING CONTRACTOR: New England Boring	COORDINATES:		
BEGUN: 6/21/95 FINISHED: 6/22/95	SUPERVISOR: B. BUELOW DRILLER: S. GRAVES	WELL SITE: North Side of South Lobe	WAER LEVEL:DEPTH/ELEV. 6.0'/79.77'



DEPTH (FT)	ELEV. (FT)

4719jp

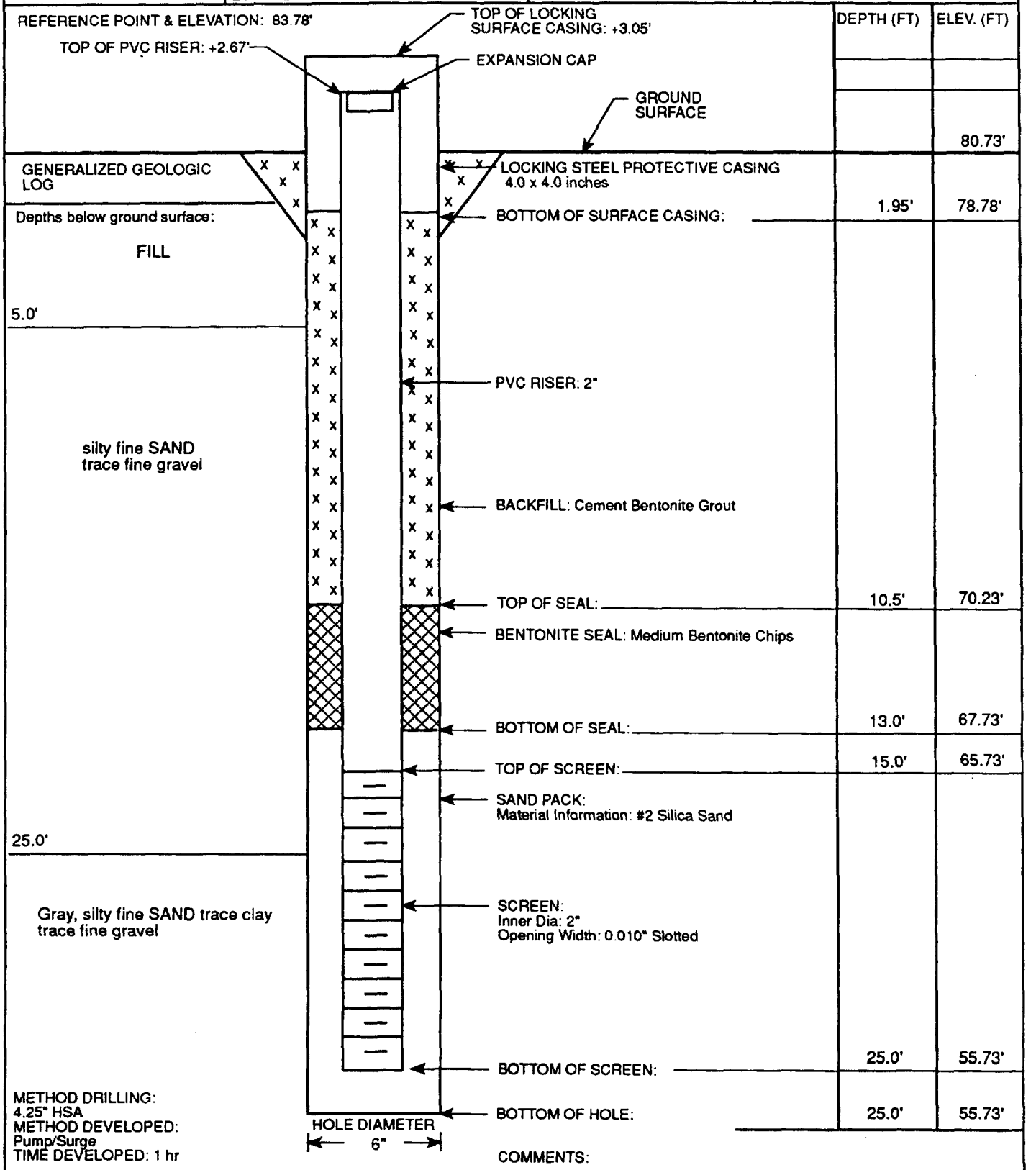
MONITORING WELL CONSTRUCTION	PROJECT: Rocco's Landfill	JOB NO. 017672-0003	WELL NO. MW-006
DRILLING CONTRACTOR: New England Boring	COORDINATES:		
BEGUN: 6/21/95 FINISHED: 6/21/95	SUPERVISOR: B. BUELOW DRILLER: S. GRAVES	WELL SITE: Southwest of Northern Lobe	WATER LEVEL:DEPTH/ELEV. 7.21'/78.83'



	DEPTH (FT)	ELEV. (FT)
		83.44'
	2.08'	81.36'
	1.0'	82.44'
	3.0'	80.44'
	5.0'	78.44'
	15.0'	68.44'
	22.0'	61.44'

4719jp

MONITORING WELL CONSTRUCTION	PROJECT: Rocco's Landfill	JOB NO. 017672-0003	WELL NO. MW-007
DRILLING CONTRACTOR: New England Boring	COORDINATES:		
BEGUN: 6/26/95 FINISHED: 6/26/95	SUPERVISOR: B. BUELOW DRILLER: T. CARPENTER	WELL SITE: South of Northern Lobe	WATER LEVEL:DEPTH/ELEV. 5.64'/78.14'



	DEPTH (FT)	ELEV. (FT)
		80.73'
BOTTOM OF SURFACE CASING:	1.95'	78.78'
TOP OF SEAL:	10.5'	70.23'
BOTTOM OF SEAL:	13.0'	67.73'
TOP OF SCREEN:	15.0'	65.73'
BOTTOM OF SCREEN:	25.0'	55.73'
BOTTOM OF HOLE:	25.0'	55.73'

4719p

Appendix C
Analytical Data/Chain of Custody

- Groundwater, Surface Water, Sediment Analysis Results (no Cyanide)
- Groundwater, Surface Water, Sediment Analysis Results (Cyanide)
- Soil Gas Analysis Results
-Chain of Custody Forms

Groundwater, Surface Water, Sediment Analysis Results (no Cyanide)

M&E Supplemental Evaluation of Rocco Landfill Data Collected June, 1995, and Analyzed and Validated by Wall Experiment Station

Groundwater Samples:

Validation of the trip blanks collected on June 27 (M&E sample ID: TB-1; DEP sample ID: 95-1815) and June 28 (M&E sample IDs: TB-2A and TB-2B; DEP sample ID 95-1902) should be summarized. No VOCs were detected in the trip blank collected June 27. However, the trip blank collected June 28 had detects for toluene (3.3 μg/L), ethylbenzene (1.1 μg/L), and xylenes (1.3 μg/L). The data for samples associated with this trip blank is unaffected as results for these compounds were either non-detected, or were greater than the blank action levels.

M&E also noted that holding time criteria was exceeded for the VOC analysis of sample MW-003S and its field duplicate, sample MW-903S. These samples were not preserved per EPA guidance, as addition of HCl caused substantial effervecense. The holding time for an unpreserved VOC sample is seven days, and the sample was analyzed fourteen days after collection. Results for these compounds should be estimated (J and UJ), in both samples.

Our evaluation of the field duplicate pair, samples MW-003S and MW-903S, shows that positive results were detected in MW-903S at concentrations greater than the sample-specific detection limits for toluene, ethylbenzene, xylenes, and 1,2,4-trimethylbenzene. These compounds were not detected in the corresponding sample. The validation action is to qualify the positive results for these compounds as estimated (J) in sample MW-903S, and the non-detected results for these compounds as estimated (UJ) in sample MW-003S.

As the VOC analysis was performed outside of holding time for the samples MW-003S and MW-903S, resampling for VOCs will be performed by M&E on October 30, 1995 at this monitoring well and will be submitted to the DEP laboratory in Lawrence, Massachusetts for analysis.

Surface Water and Sediment Samples

Our evaluation of the field duplicate samples (SW-3 and SW-4) shows that some validation criteria were not met. For the VOC analysis, toluene and xylene were detected at concentrations greater than the sample specific detection limit in sample SW-4, but were non-detected in sample SW-3. Consequently, the positive results for these compounds in sample SW-4 and the non-detected results in sample SW-3 should be qualified as estimated (J and UJ, respectively). For the semivolatile organic analyses, phenol was detected at a concentration above the detection limit in SW-3 (1.1 ug/l), but was not detected in SW-4. The validation action is to qualify the phenol results in SW-3 and SW-4 as estimated (J and UJ, respectively).

For the sediment samples, two metals, chromium and mercury, were detected in both sediment samples, however the percent difference exceeded criteria, and results for these metals are estimated (J) in both samples.

As stated in the evaluation memorandum, all of the VOC analyses for the surface water and sediment samples were analyzed outside of the holding time criteria due to illness in the laboratory. Consequently, all surface water and sediment samples will be re-collected on October 30, 1995 and submitted to the DEP laboratory in Lawrence, Massachusetts for analysis.

All of the qualifications described in the previous sections have been applied to the data by M&E.

Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Protection
Senator William X. Wall Experiment Station

William F. Weld
Governor
Trudy S. Coxe
Secretary, EOEA
David B. Struhs
Commissioner

MEMORANDUM

TO: Tom Mahin, BWP, DEP-Woburn

FROM: Robert Serabian, Quality Assurance Officer, DEP-WES R.S.

THROUGH: Dr. Oscar C. Pancorbo, Director, DEP-WES (OCP)

SUBJECT: Results for the Rocco Landfill

DATE: September 12, 1995

Enclosed are the results from the Rocco Landfill, Tewksbury, MA. The samples consisted of 124 ground water, leachate, and soil/sediment samples to be analyzed for nutrients, chemical oxygen demand, metals, total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs), volatile organic compounds, and semivolatile organic compounds. The samples were collected on 06/27/95 to 06/29/95 by Metcalf and Eddy Engineers, the Department's SARRS contractor, and brought to the Wall Experiment Station for analysis. The Wall Experiment Station supplied sample containers, sample tags, preservation reagents, and chain-of-custody forms to Metcalf and Eddy personnel.

- Soil samples were collected using grab sampling methods. Ground water samples were collected using dedicated disposable Teflon bailers. The sampling event did not require any equipment decontamination.

- The samples collected on 06/28/95 and 06/29/95 had proper chain-of-custody documentation. Samples collected on 06/27/95 were not properly documented and relinquished as chain-of-custody samples. Therefore, samples # 95-1772 to 95-1814 should **NOT** be considered to have been collected under chain-of-custody.

- The analytical data were validated at the Tier II level using the EPA Region I Data Validation Guidelines and the 1992 MSCA Quality Assurance Project Plan.

- Sample concentrations for the metals ranged from less than the detection limits to a high of 5,800 mg/Kg for iron. Quality control results for the metals were within their respective control limits with the exception of manganese (71%) and lead (72%) on the laboratory fortified matrix (LFM; 75-125% acceptance limits). For these samples, no data qualification is warranted since the lab fortified blank (LFB) and the quality control standards (QCS) were within acceptance limits. Samples # 95-1787, 95-1792, 95-1774, and 95-1781 showed good correlation between specific conductivity results and total dissolved solids. The literature has shown that the total dissolved solids concentration in water samples is usually about 65% of the specific conductivity in μmhos/cm.

- Samples analyzed for TPH and PCBs were all "not detected." The spike recoveries for PCBs (127 and 130%) and TPH (73%) were both within the 60 to 140% acceptance limits.

- Ten samples of water and sediment had detectable concentrations of volatile organic compounds (VOCs). The appropriate analytical method was used in analyzing the samples for VOCs. The trip blank collected on 06/29/95 was "not detected" for volatile organic analytes. Trip blanks were not submitted for samples collected on 06/27/95 and 06/28/95. The surrogate standard recoveries for all VOCs were within their respective acceptance limits. All samples were analyzed within the EPA-prescribed 14-day holding time, with the exception of samples # 95-1815, 95-1777, 95-1783, 95-1789, 95-1795, 95-1796, 95-1802, 95-1809, and 95-1810 which exceeded holding time by 2 days. The results for these samples are flagged as (J) estimated data. Follow-up sampling is recommended for these samples with holding-time violations. The laboratory (WES) will accept these samples and analyze them on a priority basis. Unexpected sickness and injury during the same time period for the only two analysts in the GC-MS Organics Laboratory at WES (i.e., supervisor was out sick with a bad cold and the other analyst broke his arm at home) led to these holding time violations.

- The appropriate analytical method was used in analyzing ground water, leachate, and sediment samples for semivolatile organic compounds (semi-VOCs). The semi-VOC samples were analyzed within the EPA-prescribed holding times. Eight ground water and leachate samples had detectable concentrations of semi-VOCs. With the exception of samples # 95-1904, 95-1911, 95-1919, 95-1925, and 95-1972, the recoveries for the surrogate standards in the samples were within acceptance limits. In the cases of samples # 95-1904 and 95-1919, the

base/neutral compounds could not be analyzed due to the formation of a precipitate during extraction of the sample; also, in these samples, the acid extract had to be diluted in order to quantitate phenol and as a result, the surrogate standards could not be detected. The phenolic data for these two samples are flagged as (J) estimated data. In the cases of samples # 95-1911, 95-1925, and 95-1972, the phenol extract was either lost during analysis (# 95-1925) or was associated with poor (low) surrogate recoveries due to sample matrix interferences. Consequently, the phenolic data for samples # 95-1911 and 95-1972 are flagged as (J) estimated data. However, the data for base/neutral compounds for these three samples are acceptable (i.e., surrogate recoveries were within acceptance limits) and require no qualifications. Regarding the four sediment samples (# 95-1799, 95-1803, 95-1808, and 95-1811), we found significant sample matrix interferences as shown by the poor recoveries of all surrogate standards (i.e., all recoveries falling grossly outside of acceptance limits; data are not included). Follow-up sampling is recommended for these sediment samples. If you decide to submit four new sediment samples, WES will analyze them on a priority basis; however, we may again experience matrix interferences resulting in the flagging of the data for these samples.

- The correct final concentration units were used in generating the final results.

- The concentration values were adjusted to reflect dilutions, splits, or dry weight factors.

If you want further assistance with data interpretation or analysis, please contact Dr. Oscar C. Pancorbo at (508) 682-5237, ext. 314.

The Wall Experiment Station looks forward to providing analytical expertise to the Bureau of Waste Prevention on future landfill projects. Please feel free to contact us if you have any questions.

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
. Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-1971	City/Town	Tewksbury
Collector	C. Lapite/B. Buelow/R. Bursaw	Collected	6/29/95
Received	6/30/95	Analyzed	7/13/95
Source	Rocco Landfill		
Bottle ID:	MW-001SA,B		

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery
. ɔt detected			Dibromofluoromethane	105
			Toluene-D8	106
			1,4-bromofluorobenzene	102
*MDL = Method Detection Limits				

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Alice L. Gabrielle
8/29/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-1931	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/28/95
Received	6/29/95	Analyzed	7/12/95
Source	Rocco Landfill MW002S		
Bottle ID:	MW-002SA and MW-002SB		

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery
cis-1,2-dichloroethylene	2.8	0.78	Dibromofluoromethane	104
Toluene	29	0.30	Toluene-D8	90
Ethylbenzene	3.3	0.31	1,4-bromofluorobenzene	106
Xylenes	7.9	0.40		
ɔ-propylbenzene	3.5	0.37		
n-propylbenzene	1.3	0.44		
*MDL = Method Detection Limits				

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor [signature]
8/29/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-1938	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/28/95
Received	6/29/95	Analyzed	7/12/95
Source	Rocco Landfill		
Bottle ID:	MW-002BA and MW-002BB		

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery
Not detected			Dibromofluoromethane	88
			Toluene-D8	89
			1,4-bromofluorobenzene	93
DUPLICATE ANALYSIS				
Not detected			Dibromofluoromethane	110
			Toluene-D8	98
			1,4-bromofluorobenzene	93
*MDL = Method Detection Limits				

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Alice R. Gilbertson
8/29/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-1978	City/Town	Tewksbury
Collector	C. Lapite/B. Buelow/R. Bursaw	Collected	6/29/95
Received	6/30/95	Analyzed	7/13/95
Source	Rocco Landfill		
Bottle ID:	MW-0035 (A, B) Not preserved		

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery
t detected			Dibromofluoromethane	108
			Toluene-D8	102
			1.4-bromofluorobenzene	104
*MDL = Method Detection Limits				

The sample was analyzed according to the EPA procedure. "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Peter R. Goldsmith
8/29/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-1964	City/Town	Tewksbury
Collector	C. Lapite/B. Buelow/R. Bursaw	Collected	6/29/95
Received	6/30/95	Analyzed	7/12/95
Source	Rocco Landfill		
Bottle ID:	MW-003B (A.B)		

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery
orofluoromethane	**		Dibromofluoromethane	102
..chlorofluoromethane	**		Toluene-D8	106
			1.4-bromofluorobenzene	107

* MDL = Method Detection Limits

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Alba R. Palermo
8/29/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS
OF PURGEABLE ORGANICS

Sample Number 95-1903
City/Town Tewksbury
Collector Richard Bursaw
Collected 6/28/95
Received 6/29/95
Analyzed 7/12/95
Source Rocco Landfill - MW-0045
Bottle ID: MW-0045 A and B

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery
Trichlorofluoromethane	150	0.42	Dibromofluoromethane	102
Methylene chloride	1900	0.48	Toluene-D8	106
1.1-dichloroethane	290	0.65	1.4-bromofluorobenzene	101
cis-1.2-dichloroethylene	180	0.78		
Toluene	2000	0.30		
[illegible]ylbenzene	160	0.31		
[illegible]ylenes	240	0.40		
Iso-propylbenzene	8.5	0.37		
N-propylbenzene	11	0.44		
1.2.4-trimethylbenzene	39	0.43		

* MDL = Method Detection Limits

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Alba L. Sileberty
8/31/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number 95-1910
Collector Richard Bursaw
Received 6/29/95
Source Rocco Landfill - MW-004B
Bottle ID: MW-004BA and MW-004BB

City/Town Tewksbury
Collected 6/28/95
Analyzed 7/12/95

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery
Chlorofluoromethane	**		Dibromofluoromethane	100
:hlorofluoromethane	**		Toluene-D8	103
Trichlorofluoromethane	27	0.42	1.4-bromofluorobenzene	105
Methylene chloride	33	0.48		
-dichloroethane	140	0.65		
cis-1.2-dichloroethylene	23	0.78		
Chloroform	1.4	0.66		
Toluene	1300	0.30		
Xylenes	350	0.40		
Ethylbenzene	190	0.31		
sec-butylbenzene	5.4	0.28		
Isopropylbenzene	16	0.37		
N-propylbenzene	16	0.44		
1.2.4-trimethylbenzene	74	0.43		

* MDL = Method Detection Limits

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index .d a mass spectral data base for tentative identification.

Laboratory Supervisor Alan R. Gilbertson
8/29/95

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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number 95-1917
Collector Richard Bursaw
Received 6/29/95
Source Rocco Landfill
Bottle ID: MW-005 A. B

City/Town Tewksbury
Collected 6/28/95
Analyzed 7/12/95

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery
Chlorofluoromethane	**		Dibromofluoromethane	95
Dichlorofluoromethane	**		Toluene-D8	104
chlorofluoromethane	18	0.42	1.4-bromofluorobenzene	109
Methylene chloride	850	0.48		
-dichloroethane	39	0.65		
cis-1.2-dichloroethylene	95	0.78		
Chloroform	4.9	0.66		
Toluene	900	0.30		
Ethylbenzene	140	0.31		
Xylenes	215	0.40		
Isopropylbenzene	5.5	0.37		
n-propylbenzene	3.3	0.44		
1.2.4-trimethylbenzene	17	0.43		
n-butylbenzene	0.53	0.45		

* MDL = Method Detection Limits

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index .d a mass spectral data base for tentative identification.

Laboratory Supervisor Alice R. Aldrich
8/29/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-1924	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/28/95
Received	6/29/95	Analyzed	7/12/95
Source	Rocco Landfill		
Bottle ID:	MW-006A + MW-006B		

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery
Chloroform	1.7	0.66	Dibromofluoromethane	104
Toluene	79	0.30	Toluene-D8	90
Ethylbenzene	4.7	0.31	1,4-bromofluorobenzene	106
Xylenes	16	0.40		
n-propylbenzene	0.75	0.37		
*MDL = Method Detection Limits				

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Alice R. Gilbertson
8/29/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-1985	City/Town	Tewksbury
Collector	C. Lapite/B. Buelow/R. Bursaw	Collected	6/29/95
Received	6/30/95	Analyzed	7/13/95
Source	Rocco Landfill		
Bottle ID:	MW-0075 (A, B)		

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery
Chlorofluoromethane	12	0.50	Dibromofluoromethane	103
Vinyl chloride	16	0.52	Toluene-D8	101
1.1-dichloroethane	360	0.65	1.4-bromofluorobenzene	105
1.1.1-trichloroethane	44	0.33		
Benzene	8.4	0.28		
1.2-dichloroethane	3.8	0.41		
Trichloroethylene	2.9	0.29		
Toluene	1500	0.30		
Tetrachloroethylene	3.4	0.29		
Ethylbenzene	620	0.31		
Xylenes	1300	0.40		
n-propylbenzene	46	0.44		
1.2.4-trimethylbenzene	320	0.43		

* MDL = Method Detection Limits

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics. SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Alba R. Gutierrez
8/29/95

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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-1992	City/Town	Tewksbury
Collector	C. Lapite/B. Buelow/R. Bursaw	Collected	6/29/95
Received	6/30/95	Analyzed	7/13/95
Source	Rocco Landfill		
Bottle ID:	MW-903 (A. B)		

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery
Toluene	54	0.30	Dibromofluoromethane	109
Ethylbenzene	26	0.31	Toluene-D8	103
Xylenes	61	0.40	1.4-bromofluorobenzene	104
1.2.4-trimethylbenzene	19	0.43		

* MDL = Method Detection Limits

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Alba R. Gelinas
8/29/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-1777	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/27/95
Received	6/27/95	Analyzed	7/13/95
Source	Rocco Landfill		
Bottle ID:	SW-1		

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery
etected			Dibromofluoromethane	114
			Toluene-D8	91
			1,4-bromofluorobenzene	109
*MDL = Method Detection Limits				

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics. SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Alba R. Gilbertson
8/29/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-1783	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/27/95
Received	6/27/95	Analyzed	7/13/95
Source	Rocco Landfill		
Bottle ID:	SW-2		

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery
Trichlorofluoromethane	9.8	0.42	Dibromofluoromethane	112
Methylene chloride	15	0.48	Toluene-D8	93
cis-1,2-dichloroethylene	5.2	0.78	1,4-bromofluorobenzene	109
1,1,1-trichloroethane	58	0.33		
Benzene	2.8	0.28		
Trichloroethylene	3.6	0.29		
Toluene	240	0.30		
Ethylbenzene	29	0.31		
Xylenes	54	0.40		
Isopropylbenzene	3.1	0.37		
N-propylbenzene	3.9	0.44		

* MDL = Method Detection Limits

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mas Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which hav a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partitio by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral inde and a mass spectral data base for tentative identification.

Laboratory Supervisor Albert R. Gilbertson
8/29/95

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-1789	City/Town	Tewksbury
Collector	R. Bursaw	Collected	6/27/95
Received	6/27/95	Analyzed	7/13/95
Source	Rocco Landfill		
Site ID:	SW-3		

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery
Not detected			Dibromofluoromethane	91
			Toluene-D8	97
			1,4-bromofluorobenzene	102
* MDL = Method Detection Limits				

The sample was analyzed according to the EPA procedure. "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics. SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Alba R. Silveira
8/31/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-1795	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/27/95
Received	6/27/95	Analyzed	7/13/95
Source	Rocco Landfill		
Bottle ID:	SW-4		

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery
1.1.1-trichloroethane	12	0.33	Dibromofluoromethane	106
Toluene	44	0.30	Toluene-D8	98
Ethylbenzene	9.1	0.31	1.4-bromofluorobenzene	102
Xylenes	16	0.40		
Iso-propylbenzene	1.2	0.37		
n-propylbenzene	1.2	0.44		
1.2.4-trimethylbenzene	5.2	0.43		
* MDL = Method Detection Limits				

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Alba R. D'Alessio
8/29/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-1815	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/27/95
Received	6/27/95	Analyzed	7/13/95
Source	Rocco Landfill		
Bottle ID:	TB-1		

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery
[illegible]uene	3.3	0.30	Dibromofluoromethane	106
Ethylbenzene	1.1	0.31	Toluene-D8	91
Xylenes	1.3	0.40	1.4-bromofluorobenzene	107

*MDL = Method Detection Limits

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics. SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Alba R. Medeiros
8/2?/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-1963	City/Town	Tewksbury
Collector	C. Lapite/B. Buelow/R. Bursaw	Collected	6/29/95
Received	6/30/95	Analyzed	7/12/95
Source	Rocco Landfill Trip Blank		
ID:	TB-3 (A, B)		

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery
Not detected			Dibromofluoromethane	90
			Toluene-D8	96
			1.4-bromofluorobenzene	96
*MDL = Method Detection Limits				

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Alan R. Gladwish
8/29/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-1902	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/28/95
Received	6/29/95	Analyzed	7/12/95
Source	Rocco Landfill		
Bottle ID:	TB-2A and TB-2B		

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery
ɔt detected			Dibromofluoromethane	106
			Toluene-D8	95
			1,4-bromofluorobenzene	106
*MDL = Method Detection Limits				

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics. SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Alba R. Fiedzuszko
8/29/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF SEMIVOLATILE ORGANIC COMPOUNDS

Sample Number	95-1972	City/Town	Tewksbury
Collector	C. Lapite, B. Buelow, R. Bursaw	Collected	6/29/95
Received	6/30/95	Analyzed	8/14/95 - 8/16/95
Source	Rocco Landfill	Extracted	7/6/95
	Bottle ID: MW-001SC		

RESULTS		QUALITY CONTROL		
Compounds	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
Not detected		2-fluorobiphenyl	105	30-115
		4-terphenyl-D14	87	18-137
		2-fluorophenol	16 *	25-121
		Phenol-D6	30	24-113
		Tribromophenol	16 *	19-122

The sample was analyzed by EPA "Method 8270B, Semivolatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC/MS):Capillary Column Technique".

* Sample interference

Laboratory Supervisor Alba L. Albert
9/7/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF SEMIVOLATILE ORGANIC COMPOUNDS

Sample Number	95-1932	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/28/95
Received	6/29/95	Analyzed	7/19/95 - 8/9/95
Source	Rocco Landfill	Extracted	6/30/95
	Bottle ID: MW-002SC		

RESULTS		QUALITY CONTROL		
Compounds	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
Not detected		2-fluorobiphenyl	117	30-115
		4-terphenyl-D14	108	18-137
		2-fluorophenol	90	25-121
		Phenol-D6	70	24-113
		Tribromophenol	54	19-122

The sample was analyzed by EPA "Method 8270B, Semivolatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC/MS):Capillary Column Technique".

Laboratory Supervisor Alice R. Goldsmith
9/7/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF SEMIVOLATILE ORGANIC COMPOUNDS

Sample Number	95-1939	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/28/95
Received	6/29/95	Analyzed	7/19/95 - 8/9/95
Source	Rocco Landfill	Extracted	6/30/95
	Bottle ID: MW-002BC		

RESULTS		QUALITY CONTROL		
Compounds	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
Not detected		2-fluorobiphenyl	51	30-115
		4-terphenyl-D14	56	18-137
		2-fluorophenol	63	25-121
		Phenol-D6	71	24-113
		Tribromophenol	54	19-122

The sample was analyzed by EPA "Method 8270B. Semivolatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC/MS):Capillary Column Technique".

Laboratory Supervisor Alba R. Sobieszczyk
8/31/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF SEMIVOLATILE ORGANIC COMPOUNDS

Sample Number	95-1979	City/Town	Tewksbury
Collector	C. Lapite, B. Buelow, R. Bursaw	Collected	6/29/95
Received	6/30/95	Analyzed	8/14/95 - 8/16/95
Source	Rocco Landfill	Extracted	7/6/95
	Bottle ID: MW-003SC		

RESULTS		QUALITY CONTROL		
Compounds	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
Naphthalene	18	2-fluorobiphenyl	102	30-115
		4-terphenyl-D14	102	18-137
		2-fluorophenol	50	25-121
		Phenol-D6	36	24-113
		Tribromophenol	28	19-122

The sample was analyzed by EPA "Method 8270B. Semivolatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC/MS):Capillary Column Technique".

Laboratory Supervisor Alan R. Libertz
9/7/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF SEMIVOLATILE ORGANIC COMPOUNDS

Sample Number	95-1965	City/Town	Tewksbury
Collector	C. Lapite, B. Buelow, R. Bursaw	Collected	6/29/95
Received	6/30/95	Analyzed	8/14/95 - 8/16/95
Source	Rocco Landfill	Extracted	7/6/95
	Bottle ID: MW-003BC		

RESULTS		QUALITY CONTROL		
Compounds	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
Not detected		2-fluorobiphenyl	120	30-115
		4-terphenyl-D14	77	18-137
		2-fluorophenol	35	25-121
		Phenol-D6	27	24-113
		Tribromophenol	23	19-122

The sample was analyzed by EPA "Method 8270B, Semivolatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC/MS):Capillary Column Technique".

Laboratory Supervisor Peter R. D'Ambrosio
8/31/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF SEMIVOLATILE ORGANIC COMPOUNDS

Sample Number	95-1904	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/28/95
Received	6/29/95	Analyzed	8/9/95
Source	Rocco Landfill	Extracted	6/30/95
	Bottle ID: MW-004SC		

RESULTS		QUALITY CONTROL		
Compounds	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
Phenol	1400	2-fluorobiphenyl	*	30-115
		4-terphenyl-D14	*	18-137
		2-fluorophenol	*	25-121
		Phenol-D6	*	24-113
		Tribromophenol	*	19-122

The sample was analyzed by EPA "Method 8270B. Semivolatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC/MS):Capillary Column Technique".

* Remarks: The base/neutral compounds could not be determined in this sample, due to the formation of a precipitate during extraction. For the analysis of phenols. the acid extract had to be diluted one thousand times. At this dilution, the surrogate standards can not be detected.

Laboratory Supervisor Alice R. Gabrielle
8/7/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF SEMIVOLATILE ORGANIC COMPOUNDS

Sample Number	95-1911	City/Town	Tewksbury
Collector	R. Bursaw	Collected	6/28/95
Received	6/29/95	Analyzed	7/19/95 - 8/9/95
Source	Rocco Landfill	Extracted	6/30/95
	Bottle ID: MW-004BC		

RESULTS		QUALITY CONTROL		
Compounds	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
Diethyl phthalate	38	2-fluorobiphenyl	120	30-115
		4-terphenyl-D14	138	18-137
		2-fluorophenol	6 *	25-121
		Phenol-D6	12 *	24-113
		Tribromophenol	34	19-122

The sample was analyzed by EPA "Method 8270B, Semivolatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC/MS):Capillary Column Technique".

* Sample interference.

Laboratory Supervisor Peter R. Pletnetz
9/7/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF SEMIVOLATILE ORGANIC COMPOUNDS

Sample Number	95-1919	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/28/95
Received	6/29/95	Analyzed	8/9/95
Source	Rocco Landfill	Extracted	6/30/95
	Bottle ID: MW-005D		

RESULTS		QUALITY CONTROL		
Compounds	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
Phenol	1200	2-fluorobiphenyl	*	30-115
		4-terphenyl-D14	*	18-137
		2-fluorophenol	*	25-121
		Phenol-D6	*	24-113
		Tribromophenol	*	19-122

The sample was analyzed by EPA "Method 8270B, Semivolatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC/MS):Capillary Column Technique".

* Remarks: The base/neutral compounds could not be determined in this sample, due to the formation of a precipitate during extraction. For the analysis of phenols, the acid extract had to be diluted one thousand times. At this dilution, the surrogate standards can not be detected.

Laboratory Supervisor Debra R. Edwards
9/7/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF SEMIVOLATILE ORGANIC COMPOUNDS

Sample Number	95-1925	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/28/95
Received	6/29/95	Analyzed	7/19/95
Source	Rocco Landfill	Extracted	6/30/95
	Bottle ID: MW-006C		

RESULTS		QUALITY CONTROL		
Compounds	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
Not detected		2-fluorobiphenyl	105	30-115
		4-terphenyl-D14	69	18-137
		2-fluorophenol	*	25-121
		Phenol-D6	*	24-113
		Tribromophenol	*	19-122

The sample was analyzed by EPA "Method 8270B, Semivolatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC/MS):Capillary Column Technique".

* The phenol extract was lost in analysis.

Laboratory Supervisor Alba R. Flaherty
9/7/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF SEMIVOLATILE ORGANIC COMPOUNDS

Sample Number	95-1986	City/Town	Tewksbury
Collector	C. Lapite, B. Buelow, R. Bursaw	Collected	6/29/95
Received	6/30/95	Analyzed	8/14/95 - 8/16/95
Source	Rocco Landfill	Extracted	7/6/95
	Bottle ID: MW-007C		

RESULTS		QUALITY CONTROL		
Compounds	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
Naphthalene	6.3	2-fluorobiphenyl	104	30-115
Phenol	15	4-terphenyl-D14	85	18-137
		2-fluorophenol	34	25-121
		Phenol-D6	34	24-113
		Tribromophenol	99	19-122

The sample was analyzed by EPA "Method 8270B, Semivolatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC/MS):Capillary Column Technique".

Laboratory Supervisor Nina L. Manasse
5/31/95 (OP)

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF SEMIVOLATILE ORGANIC COMPOUNDS

Sample Number	95-1993	City/Town	Tewksbury
Collector	C. Lapite. B. Buelow, R. Bursaw	Collected	6/29/95
Received	6/30/95	Analyzed	8/14/95 - 8/16/95
Source	Rocco Landfill	Extracted	7/6/95
	Bottle ID: MW-903C		

RESULTS		QUALITY CONTROL		
Compounds	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
Naphthalene	19	2-fluorobiphenyl	87	30-115
		4-terphenyl-D14	93	18-137
		2-fluorophenol	40	25-121
		Phenol-D6	29	24-113
		Tribromophenol	98	19-122

The sample was analyzed by EPA "Method 8270B, Semivolatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC/MS):Capillary Column Technique".

Laboratory Supervisor Alba K. Flaherty
8/31/95 (OP)

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DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF SEMIVOLATILE ORGANIC COMPOUNDS

Sample Number	95-1772	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/27/95
Received	6/28/95	Analyzed	7/19/95 - 8/8/95
Source	Rocco Landfill	Extracted	6/29/95
	Bottle ID: SW-1		

RESULTS		QUALITY CONTROL		
Compounds	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
Not detected		2-fluorobiphenyl	104	30-115
		4-terphenyl-D14	86	18-137
		2-fluorophenol	60	25-121
		Phenol-D6	57	24-113
		Tribromophenol	84	19-122

The sample was analyzed by EPA "Method 8270B. Semivolatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC/MS):Capillary Column Technique".

Laboratory Supervisor Alba R. Albanese
8/31/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF SEMIVOLATILE ORGANIC COMPOUNDS

Sample Number	95-1782	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/27/95
Received	6/28/95	Analyzed	7/19/95 - 8/8/95
Source	Rocco Landfill	Extracted	6/29/95
	Bottle ID: SW-2		

RESULTS		QUALITY CONTROL		
Compounds	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
Naphthalene	1.8	2-fluorobiphenyl	98	30-115
Phenol	46	4-terphenyl-D14	73	18-137
		2-fluorophenol	95	25-121
		Phenol-D6	94	24-113
		Tribromophenol	65	19-122

The sample was analyzed by EPA "Method 8270B. Semivolatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC/MS):Capillary Column Technique".

Laboratory Supervisor Alba R. Filadelfia
9/7/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF SEMIVOLATILE ORGANIC COMPOUNDS

Sample Number	95-1788	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/27/95
Received	6/28/95	Analyzed	7/19/95 - 8/8/95
Source	Rocco Landfill	Extracted	6/29/95
	Bottle ID: SW-3		

RESULTS		QUALITY CONTROL		
Compounds	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
Phenol	1.1	2-fluorobiphenyl	105	30-115
		4-terphenyl-D14	67	18-137
		2-fluorophenol	81	25-121
		Phenol-D6	84	24-113
		Tribromophenol	46	19-122

The sample was analyzed by EPA "Method 8270B. Semivolatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC/MS):Capillary Column Technique".

Laboratory Supervisor Lisa R. Libertz
9/7/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF SEMIVOLATILE ORGANIC COMPOUNDS

Sample Number	95-1793	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/27/95
Received	6/28/95	Analyzed	7/19/95 - 8/8/95
Source	Rocco Landfill	Extracted	6/29/95
	Bottle ID: SW-4		

RESULTS		QUALITY CONTROL		
Compounds	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
Not detected		2-fluorobiphenyl	99	30-115
		4-terphenyl-D14	73	18-137
		2-fluorophenol	86	25-121
		Phenol-D6	81	24-113
		Tribromophenol	55	19-122

The sample was analyzed by EPA "Method 8270B. Semivolatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC/MS):Capillary Column Technique".

Laboratory Supervisor Alice R. Silverty
9/7/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number 95-1796
City/Town Tewksbury
Collector Richard Bursaw
Collected 6/27/95
Received 6/27/95
Analyzed 7/13/95
Source Rocco Landfill
Bottle ID: SED-1

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/g	µg/g	Surrogate Standards	%Recovery
ɔt detected			Dibromofluoromethane	89
			Toluene-D8	92
			1.4-bromofluorobenzene	90
*MDL = Method Detection Limits				

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics. SW-846. 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Alan R. Oleleuta
8/29/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-1802	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/27/95
Received	6/27/95	Analyzed	7/13/95
Source	Rocco Landfill		
Bottle ID:	SED-2		

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/g	µg/g	Surrogate Standards	%Recovery
detected			Dibromofluoromethane	88
			Toluene-D8	90
			1,4-bromofluorobenzene	92
*MDL = Method Detection Limits				

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Alba R. Silvestro
9/29/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-1809	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/27/95
Received	6/27/95	Analyzed	7/13/95
Source	Rocco Landfill		
Bottle ID:	SED-3		

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/g	µg/g	Surrogate Standards	%Recovery
N[illegible] detected			Dibromofluoromethane	87
			Toluene-D8	91
			1.4-bromofluorobenzene	89
*MDL = Method Detection Limits				

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Albert R. Gilgenbach
7/29/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-1810	City/Town	Tewksbury
Collector	Richard Bursaw	Collected	6/27/95
Received	6/27/95	Analyzed	7/13/95
Source	Rocco Landfill		
Bottle ID:	SED-4		

RESULTS		MDL*	QUALITY CONTROL	
Compounds	µg/g	µg/g	Surrogate Standards	%Recovery
ot detected			Dibromofluoromethane	88
			Toluene-D8	87
			1,4-bromofluorobenzene	95
*MDL = Method Detection Limits				

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds whici have a significant vapor pressure in aqueous solution at room temperature and thus are amenable tc partition by purging are detected by this procedure.

**No standard available for quantification. The mass spectrum was compared to a mass spectral inde and a mass spectral data base for tentative identification.

Laboratory Supervisor Alba R. Gilardetti
8/29/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

SPECIAL ANALYSIS

CITY/TOWN Tewksbury

COLLECTOR Lapite/Bursaw/Buelow

SOURCE A Rocco Landfill MW 003 BF

SOURCE B Rocco Landfill MW 001 SF

SOURCE C Rocco Landfill MW 003 SE

Approved JRL

Conc. Units. **mg/L**

Date 8-15-95

	A	B	C	D	E	F
Sample No.	95-1968	95-1975	95-1982	Analytical Method	Date Analyzed	MDL
Date of Collection	6/29/95	6/29/95	6/29/95			
Date of Receipt	6/30/95	6/30/95	6/30/95			
Iron	52	60	27	EPA 6010A	7/12/95	0.01
Manganese	0.64	3.5	3.7	EPA 6010A	7/12/95	0.01

Remarks:

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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

SPECIAL ANALYSIS

CITY/TOWN Tewksbury

COLLECTOR Lapite/Bursaw/Buelow

SOURCE A Rocco Landfill MW 007 G

SOURCE B Rocco Landfill MW 903 E

SOURCE C

Approved JNJ

Conc. Units. mg/L

Date 8-15-95

	A	B	C	D	E	F
Sample No.	95-1989	95-1995		Analytical Method	Date Analyzed	MDL
Date of Collection	6/29/95	6/29/95				
Date of Receipt	6/30/95	6/30/95				
Iron	48	27		EPA 6010A	7/12/95	0.01
Manganese	4.1	1.3		EPA 6010A	7/12/95	0.01

Remarks:

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DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

SPECIAL ANALYSIS

CITY/TOWN Tewksbury

COLLECTOR CR/RB

Source A SED - 1, Lot #27
Source B SED - 2, Lot #29
Source C SED - 3, Lot #34
Source D SED - 4, Lot #41
Source E Laboratory Blank
Source F Laboratory Spike

Michael D. Bebrin
7/27/95

	A	B	C	D	E	F
Sample No.	95-1798	95-1800	95-1805	95-1812	Laboratory Blank	Laboratory Spike
Date of Collection	6/27/95	6/27/95	6/27/95	6/27/95	-	-
Date of Receipt	6/28/95	6/28/95	6/28/95	6/28/95	-	-
Date Analyzed	6/28/95-7/20/95	6/28/95-7/20/95	6/28/95-7/20/95	6/28/95-7/20/95	6/28/95-7/20/95	6/28/95-7/20/95
PCB Analysis (µg/g)	ND	ND	ND	ND	ND	A1254 Exp = 1.08 Theo = 0.85
Spike % Recovery						127

REMARKS: The samples were analyzed according to the EPA procedure Method 8080, Organochlorine Pesticides and PCBs, SW - 846.
ND = Not detected or the analytical result is at or below the established MDL of:
A1242 = 0.15 µg/g A1260 = 0.13 µg/g
A1248 = 0.084 µg/g
A1254 = 0.08 µg/g
NS = Not spiked

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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

SPECIAL ANALYSIS

CITY/TOWN_____

COLLECTOR_____

Source A Laboratory Spike

Source B

Source C

Source D

Source E

Source F

	A	B	C	D	E
mple No.	Laboratory Spike				
Date of Collection					
Date of Receipt					
Date Analyzed	6/29-7/12/95				
Total petroleum hydrocarbons (µg/g)	Exp = 510 Theo = 700				
Spike % Recovery	73				

REMARKS: The samples were analyzed according to Methods 5520A, E & F "Extraction Method : Sludge Samples". Standard Methods, 18th Edition, 1992.

ND = Not detected or the analytical result is at or below the established MDL of 45. µg/g.

Due to environmental concerns relating to the use of freon, pentane was utilized as the extract: solvent.

\Mike\AEF.65

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

SPECIAL ANALYSIS

CITY/TOWN Tewksbury

COLLECTOR CL/RB

Source A SED - 1, lot #26

Source B SED - 2, lot #33

Source C SED - 3, lot #36

Source D SED - 4, Lot #43

Source E Laboratory Blank

Source F

Michael D. Bebrian
7/27/95

	A	B	C	D	E
Sample No.	95-1797	95-1804	95-1807	95-1814	Laboratory Blank
Date of Collection	6/27/95	6/27/95	6/27/95	6/27/95	-
Date of Receipt	6/28/95	6/28/95	6/28/95	6/28/95	-
Date Analyzed	6/29-7/12/95	6/29-7/12/95	6/29-7/12/95	6/29-7/12/95	6/29-7/12/95
Total petroleum hydrocarbons (µg/g)	ND	ND	ND	ND	ND

REMARKS: The samples were analyzed according to Methods 5520A, E & F "Extraction Method f: Sludge Samples". Standard Methods, 18th Edition, 1992.

ND = Not detected or the analytical result is at or below the established MDL of 45. µg/g.

Due to environmental concerns relating to the use of freon, pentane was utilized as the extracti solvent.

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

RCRA METALS

City/Town Tewksbury

Collector R. Bursaw

Source A Rocco Landfill - Sed - 1
Source B
Source C

Matrix: Solid

Approved KAH

Conc. Units mg/Kg. wet weight

Date 8-28-95

	A	B	C			
Sample No.	95-1817			Analytical Method	Date Analyzed	MDL
Date of Collection	6/27/95					mg/Kg
Date of Receipt	6/28/95					
Mercury	0.06			EPA 7470A	8/7/95	0.0002
Arsenic	2.80			EPA 7060A	7/21/95	0.002
Selenium	< MDL			EPA 7740	7/24/95	0.002
Barium	< MDL			EPA 6010A	7/20/95	0.01
Silver	< MDL			EPA 6010A	7/21/95	0.01
Chromium	7.7			EPA 6010A	7/20/95	0.01
Cadmium	< MDL			EPA 6010A	7/19/95	0.01
Lead	< MDL			EPA 6010A	7/19/95	0.05
Cyanide	< MDL			EPA 9010A	7/12/95	0.02
Copper	7.7			EPA 6010A	7/20/95	0.01
Zinc	33			EPA 6010A	7/21/95	0.01
Iron	4650			EPA 6010A	7/19/95	0.01
Manganese	86			EPA 6010A	8/7/95	0.01
% Solids	80				7/24/95	

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station 1887-1989

QUALITY CONTROL DATA

City/Town: Tewksbury

Collector: Lapite/Bursaw\Buelow

Remarks:

Matrix: water

Conc. Units: mg/L

SAMPLE ID	ANALYTE	PRECISION			ACCURACY, % RECOVERY			MDL mg/L	METHOD
		Sample	Duplicate	Range	LFB	QCS	LFM		
95-2193	Hg	< MDL	< MDL		93	103	108	0.0002	EPA 7470A
95-1995	Fe	27	27	0.0	90	95	*	0.01	EPA 6010A
95-1995	Mn	1.32	1.20	0.12	88	90	120	0.01	EPA 6010A

Remarks: * Spike came too low to be seen.

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Approved: J. N.S

Date: 8-15-95

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station 1887-1989

QUALITY CONTROL DATA

City/Town: Tewksbury

Collector: R. Bursaw

Remarks:

Matrix: Solid

Conc. Units: mg/Kg, wet wt

SAMPLE ID	ANALYTE	PRECISION			ACCURACY, % RECOVERY			MDL mg/L	METHOD
		Sample	Duplicate	Range	LFB	QCS	LFM		
95-1817	As	2.90	2.69	0.21	118	103	128	0.002	EPA 7060A
95-1817	Se	< MDL	< MDL		94	95	130	0.002	EPA 7740
95-1801	Hg	0.72	0.70	0.02	93	103	102	0.0002	EPA 7470
95-1817	Fe	5192	4120	1070	100	100	**	0.01	EPA 6010A
95-1817	Mn	94	78	16	86	100	71	0.01	EPA 6010A
95-1817	Ba	< MDL	< MDL		89	96	80	0.01	EPA 6010A
95-1817	Ag	< MDL	< MDL		*	86	*	0.01	EPA 6010A
95-1817	Cd	< MDL	< MDL		90	100	102	0.01	EPA 6010A
95-1817	Cr	7.7	*		86	85	90	0.01	EPA 6010A
95-1817	Cu	7.7	*		91	95	84	0.01	EPA 6010A
95-1817	Pb	< MDL	< MDL		100	98	72	0.05	EPA 6010A
95-1817	Zn	32	34	2.0	106	99	103	0.01	EPA 6010A

Remarks: * Not run
** Spike insignificant

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Approved: KAH
Date: 8-25-91

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

RCRA METALS

City/Town Tewksbury

Collector R. Bursaw

Source A Rocco Landfill - SW-4
Source B
Source C

Matrix: Liquid

Approved KGB

Conc. Units mg/L

Date 8-25-9

	A	B	C			
Sample No.	95-1790			Analytical Method	Date Analyzed	MDL
Date of Collection	6/27/95					mg/L
Date of Receipt	6/28/95					
Mercury	< MDL			EPA 7470A	8/7/95	0.0002
Arsenic	0.080			EPA 7060A	7/20/95	0.002
Selenium	< MDL			EPA 7740	7/12/95	0.002
Barium	0.05			EPA 6010A	7/11/95	0.01
Silver	< MDL			EPA 6010A	7/12/95	0.01
Chromium	< MDL			EPA 6010A	7/20/95	0.01
Cadmium	< MDL			EPA 6010A	7/19/95	0.01
Lead	< MDL			EPA 6010A	7/19/95	0.05
Zinc	< MDL			EPA 6010A	7/20/95	0.01
Copper	< MDL			EPA 6010A	7/20/95	0.01
Iron	10			EPA 6010A	7/6/95	0.01
Manganese	0.93			EPA 6010A	7/6/95	0.01

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

RCRA METALS

City/Town Tewksbury

Collector R. Bursaw

Source A Rocco Landfill - SW-1
Source B Rocco Landfill - SW-2
Source C Rocco Landfill - SW-3

Matrix: Liquid

Approved KAH

Conc. Units mg/L

Date 8-28-95

	A	B	C			
Sample No.	95-1776	95-1778	95-1786	Analytical Method	Date Analyzed	MDL
Date of Collection	6/27/95	6/27/95	6/27/95			mg/L
Date of Receipt	6/28/95	6/28/95	6/28/95			
Mercury	< MDL	< MDL	< MDL	EPA 7470A	8/7/95	0.0002
Arsenic	0.002	0.049	0.068	EPA 7060A	7/20/95	0.002
Selenium	< MDL	< MDL	< MDL	EPA 7740	7/12/95	0.002
Barium	0.02	0.10	0.05	EPA 6010A	7/11/95	0.01
Silver	< MDL	< MDL	< MDL	EPA 6010A	7/12/95	0.01
Chromium	< MDL	< MDL	< MDL	EPA 6010A	7/20/95	0.01
Cadmium	< MDL	< MDL	< MDL	EPA 6010A	7/19/95	0.01
Lead	< MDL	< MDL	< MDL	EPA 6010A	7/19/95	0.05
Zinc	0.03	< MDL	0.01	EPA 6010A	7/21/95	0.01
Copper	< MDL	< MDL	< MDL	EPA 6010A	7/20/95	0.01
Iron	9.4	9.4	10	EPA 6010A	7/6/95	0.01
Manganese	0.66	0.66	0.89	EPA 6010A	7/6/95	0.01

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

RCRA METALS

City/Town Tewksbury

Collector R. Bursaw

Source A Rocco Landfill - MW005~~E~~ 45
Source B Rocco Landfill - MW004BE
Source C Rocco Landfill - MW005E

Matrix: Liquid

Approved KGH

Conc. Units mg/L

Date 8-25-95

	A	B	C			
Sample No.	95-1906	95-1913	95-1920	Analytical Method	Date Analyzed	MDL
Date of Collection	6/28/95	6/28/95	6/28/95			mg/L
Date of Receipt	6/29/95	6/29/95	6/29/95			
Mercury	< MDL	< MDL	< MDL	EPA 7470A	8/7/95	0.0002
Arsenic	0.139	1.15	0.875	EPA 7060A	7/20/95	0.002
Selenium	< MDL	< MDL	< MDL	EPA 7740	7/12/95	0.002
Barium	1.6	0.39	1.4	EPA 6010A	8/9/95	0.01
Silver	< MDL	< MDL	< MDL	EPA 6010A	7/13/95	0.01
Copper	0.20	< MDL	0.14	EPA 6010A	7/20/95	0.01
Chromium	< MDL	< MDL	< MDL	EPA 6010A	7/20/95	0.01
Cadmium	< MDL	< MDL	< MDL	EPA 6010A	7/19/95	0.01
Lead	0.07	< MDL	< MDL	EPA 6010A	7/19/95	0.05
Zinc	0.23	0.04	0.18	EPA 6010A	7/21/95	0.01
Iron	758	0.85	430	EPA 6010A	7/12/95	0.01
Manganese	42	0.74	11	EPA 6010A	7/6/95	0.01

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

RCRA METALS

City/Town Tewksbury

Collector R. Bursaw

Source A Rocco Landfill - MW006E
Source B Rocco Landfill - MW002SE
Source C Rocco Landfill - MW002BE

Matrix: Liquid

Approved KAH

Conc. Units mg/L

Date 8-25-9

	A	B	C			
Sample No.	95-1927	95-1934	95-1941	Analytical Method	Date Analyzed	MDL
Date of Collection	6/28/95	6/28/95	6/28/95			mg/L
Date of Receipt	6/29/95	6/29/95	6/29/95			
Mercury	< MDL	< MDL	< MDL	EPA 7470A	8/7/95	0.0002
Arsenic	0.103	0.790	0.004	EPA 7060A	7/20/95	0.002
Selenium	< MDL	< MDL	< MDL	EPA 7740	7/12/95	0.002
Barium	0.26	0.23	0.01	EPA 6010A	7/11/95	0.01
Silver	< MDL	< MDL	< MDL	EPA 6010A	7/12/95	0.01
Chromium	< MDL	< MDL	< MDL	EPA 6010A	7/20/95	0.01
Cadmium	< MDL	< MDL	< MDL	EPA 6010A	7/19/95	0.01
Lead	< MDL	< MDL	< MDL	EPA 6010A	7/19/95	0.05
Copper	0.05	< MDL	< MDL	EPA 6010A	7/20/95	0.01
Zinc	0.25	0.09	0.02	EPA 6010A	7/21/95	0.01
Iron	34	40	34	EPA 6010A	7/12/95	0.01
Manganese	3.9	3.9	0.43	EPA 6010A	7/12/95	0.01

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

RCRA METALS

City/Town Tewksbury

Collector Lapite/Bursaw/Buelow

Source A Rocco Landfill MW 003 BE
Source B Rocco Landfill MW 001 SD
Source C Rocco Landfill MW 003 SF

Approved JHJ

Conc. Units mg/L

Date 8-15-95

	A	B	C			
Sample No.	95-1967	95-1973	95-1981	Analytical Method	Date Analyzed	MDL
Date of Collection	6/29/95	6/29/95	6/29/95			mg/L
Date of Receipt	6/30/95	6/30/95	6/30/95			
Mercury	< MDL	< MDL	< MDL	EPA 7470A	8/7/95	0.0002
Arsenic	0.042	0.127	0.407	EPA 7060A	7/20/95	0.002
Selenium	< MDL	< MDL	< MDL	EPA 7740	7/25/95	0.002
Barium	0.04	0.16	0.28	EPA 6010A	7/11/95	0.01
Silver	< MDL	< MDL	< MDL	EPA 6010A	7/12/95	0.01
Copper	0.04	0.06	< MDL	EPA 6010A	7/20/95	0.01
Chromium	< MDL	0.06	< MDL	EPA 6010A	7/20/95	0.01
Cadmium	< MDL	< MDL	< MDL	EPA 6010A	7/19/95	0.01
Lead	< MDL	< MDL	< MDL	EPA 6010A	7/19/95	0.05
Zinc	0.27	0.34	0.17	EPA 6010A	7/21/95	0.01
Iron	59	62	24	EPA 6010A	7/12/95	0.01
Manganese	0.70	4.2	1.2	EPA 6010A	7/12/95	0.01

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

RCRA METALS

City/Town Tewksbury

Collector Lapite/Bursaw/Buelow

Source A Rocco Landfill MW 007 E1, E2
Source B Rocco Landfill MW 903 D
Source C

Approved JNA

Conc. Units mg/L

Date 8-15-95

	A	B	C			
Sample No.	95-1988	95-1994		Analytical Method	Date Analyzed	MDL
Date of Collection	6/29/95	6/29/95				mg/L
Date of Receipt	6/30/95	6/30/95				
Mercury	< MDL	< MDL		EPA 7470A	8/7/95	0.0002
Arsenic	0.115	0.363		EPA 7060A	7/20/95	0.002
Selenium	< MDL	< MDL		EPA 7740	7/25/95	0.002
Barium	0.62	0.31		EPA 6010A	7/11/95	0.01
Silver	< MDL	< MDL		EPA 6010A	7/12/95	0.01
Copper	0.03	0.03		EPA 6010A	7/20/95	0.01
Chromium	< MDL	< MDL		EPA 6010A	7/20/95	0.01
Cadmium	< MDL	< MDL		EPA 6010A	7/19/95	0.01
Lead	< MDL	< MDL		EPA 6010A	7/19/95	0.05
Zinc	0.09	0.15		EPA 6010A	7/21/95	0.01
Iron	46	27		EPA 6010A	7/12/95	0.01
Manganese	4.2	1.3		EPA 6010A	7/12/95	0.01

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

SPECIAL ANALYSIS

CITY/TOWN Tewksbury

COLLECTOR R. Bursaw

SOURCE A Rocco Landfill - SW-1

SOURCE B Rocco Landfill - SW-2

SOURCE C Rocco Landfill - SW-3

MATRIX: Liquid

Approved KAH

Conc. Units. mg/L

Date 8-25-95

	A	B	C	D	E	F
Sample No.	95-1775	95-1780	95-1785	Analytical Method	Date Analyzed	MDL
Date of Collection	6/27/95	6/27/95	6/27/95			mg/L
Date of Receipt	6/28/95	6/28/95	6/28/95			
Iron	2.3	9.3	11	EPA 6010A	7/6/95	0.01
Manganese	0.64	0.65	0.95	EPA 6010A	7/6/95	0.01

Remarks:

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

SPECIAL ANALYSIS

CITY/TOWN Tewksbury

COLLECTOR R. Bursaw

SOURCE A Rocco Landfill - SW-4

SOURCE B

SOURCE C

MATRIX: Liquid

Approved KAH

Conc. Units. mg/L

Date 8-25-95

	A	B	C	D	E	F
Sample No.	95-1791			Analytical Method	Date Analyzed	MDL
Date of Collection	6/27/95					mg/L
Date of Receipt	6/28/95					
Iron	11			EPA 6010A	7/6/95	0.01
Manganese	0.96			EPA 6010A	7/6/95	0.01

Remarks:

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

SPECIAL ANALYSIS

CITY/TOWN Tewksbury

COLLECTOR R. Bursaw

SOURCE A Rocco Landfill - MW-004SG

SOURCE B Rocco Landfill - MW-004BG

SOURCE C Rocco Landfill - MW-005G

MATRIX: Liquid

Approved KBH

Conc. Units. mg/L

Date 8-25-95

	A	B	C	D	E	F
Sample No.	95-1907	95-1914	95-1921	Analytical Method	Date Analyzed	MDL
Date of Collection	6/28/95	6/28/95	6/28/95			mg/L
Date of Receipt	6/29/95	6/29/95	6/29/95			
Manganese	36	3.7	11	EPA 6010A	7/6/95	0.01
Iron	656	274	358	EPA 6010A	7/6/95	0.01

Remarks:

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

SPECIAL ANALYSIS

CITY/TOWN Tewksbury

COLLECTOR R. Bursaw

SOURCE A Rocco Landfill - MW-006H

SOURCE B Rocco Landfill - MW-002SG

SOURCE C Rocco Landfill - MW-002BG

MATRIX: Liquid

Approved KAH

Conc. Units. mg/L

Date 8-25-95

	A	B	C	D	E	F
Sampie No.	95-1930	95-1935	95-1942	Analytical Method	Date Analyzed	MDL
Date of Collection	6/28/95	6/28/95	6/28/95			mg/L
Date of Receipt	6/29/95	6/29/95	6/29/95			
Manganese	4.0	3.5	0.37	EPA 6010A	7/6/95	0.01
Iron	21	33	18	EPA 6010A	7/6/95	0.01

Remarks:

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

SPECIAL ANALYSIS

CITY/TOWN Tewksbury

COLLECTOR R. Barsau

SOURCE A Rocco Landfill, MW004 5D
SOURCE B Rocco Landfill, MW004 BD
SOURCE C Rocco Landfill, MW005 C
SOURCE D Rocco Landfill, MW006 D

APPROVED BY Michael A. Ziino

DATE 7/27/95

	A	B	C	D
Sample No.	95-1905	95-1912	95-1918	95-1926
Date of Collection	6/28/95	6/28/95	6/28/95	6/28/95
Date of Receipt	6/29/95	6/29/95	6/29/95	6/29/95
Date Analyzed	6/30-7/20/95	6/30-7/20/95	6/30-7/20/95	6/30-7/20/95
PCB Analysis (ug/L)	ND	ND	ND	ND

The samples were analyzed according to EPA Method 608-Organochlorine Pesticides and PCBs.

ND = Not detected or the analytical result is at or below the established MDL of PCB 1242 = 0.41µg/L, PCB A1254 = 0.15µg/L, PCB A1260 = 0.30µg/L, PCB A1248 = 0.79µg/L.

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

SPECIAL ANALYSIS

CITY/TOWN Tewksbury

COLLECTOR R. Barsau

SOURCE A Rocco Landfill, MW002 SD
SOURCE B Rocco Landfill, MW002 BD
SOURCE C Rocco Landfill, MW003 BD
SOURCE D Rocco Landfill, MW001 SE

APPROVED BY Michael D. Bebrin

DATE 7/27/95

	A	B	C	D
Sample No.	95-1933	95-1940	95-1966	95-1974
Date of Collection	6/28/95	6/28/95	6/29/95	6/29/95
Date of Receipt	6/29/95	6/29/95	6/30/95	6/30/95
Date Analyzed	6/30-7/20/95	7/5-20/95	7/5-20/95	7/5-20/95
PCB Analysis (ug/L)	ND	ND	ND	ND

The samples were analyzed according to EPA Method 608-Organochlorine Pesticides and PCBs.

ND = Not detected or the analytical result is at or below the established MDL of PCB 1242 = 0.41µg/L, PCB A1254 = 0.15µg/L, PCB A1260 = 0.30µg/L, PCB A1248 = 0.79µg/L.

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

SPECIAL ANALYSIS

CITY/TOWN Tewksbury

COLLECTOR R. Barsau

SOURCE A Rocco Landfill, MW003 SD
SOURCE B Rocco Landfill, MW007 D
SOURCE C Rocco Landfill, MW903 F
SOURCE D

APPROVED BY Michael O. Beland

DATE 7/27/95

	A	B	C	D
Sample No.	95-1980	95-1987	95-1996	
Date of Collection	6/29/95	6/29/95	6/29/95	
Date of Receipt	6/30/95	6/30/95	6/30/95	
Date Analyzed	7/5-7/20/95	7/5-7/20/95	7/5-7/20/95	
PCB Analysis (ug/L)	ND	ND	ND	

The samples were analyzed according to EPA Method 608-Organochlorine Pesticides and PCBs.

ND = Not detected or the analytical result is at or below the established MDL of PCB 1242 = 0.41µg/L, PCB A1254 = 0.15µg/L, PCB A1260 = 0.30µg/L, PCB A1248 = 0.79µg/L.

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

SPECIAL ANALYSIS

CITY/TOWN Tewksbury

COLLECTOR _____

SOURCE A Laboratory Blank #1
SOURCE B Laboratory Blank #2
SOURCE C Laboratory Spike, PCB A1260
SOURCE D

APPROVED BY Michael D. Beliveau

DATE 7/27/95

	A	B	C	D
Sample No.	Laboratory Blank #1	Laboratory Blank #2	Laboratory Spike	
Date of Collection				
Date of Receipt				
Date Analyzed	6/30-7/20/95	7/5-7/20/95	7/5-7/20/95	
PCB Analysis (ug/L)	ND	ND	A1260 Exp = 6.5 Theo = 5.0	
Spike % Recovery			130	

The samples were analyzed according to EPA Method 608-Organochlorine Pesticides and PCBs.

ND = Not detected or the analytical result is at or below the established MDL of PCB 1242 = 0.41µg/L, PCB A1254 = 0.15µg/L, PCB A1260 = 0.30µg/L, PCB A1248 = 0.79µg/L.

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

SPECIAL ANALYSIS

CITY/TOWN Tewksbury

COLLECTOR Lapite/Bursaw/Buelow

SOURCE A Rocco Landfill MW 003 BG

SOURCE B Rocco Landfill MW 001 SG

SOURCE C Rocco Landfill MW 003 SH

Approved JHL

Conc. Units. mg/L

Date 8-3-95

	A	B	C	D	E	F
Sample No.	95-1969	95-1976	95-1984	AnalyticalMethod	Date Analyzed	MDL
Date of Collection	6/29/95	6/29/95	6/29/95			
Date of Receipt	6/30/95	6/30/95	6/30/95			
Chloride	8.0	49	600	SM4500-C1 B	7/6/95	1.0
Sulfate	8.0	36	2.0	EPA 375.4	7/5/95	2.0
Alkalinity($CaC0_3$)	50	24	2000	SM2320B	6/30/95	1.0
Conductivity(μmhos/cm)	170	265	4750	EPA 120.1	7/5/95	

Remarks:

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
LAWRENCE EXPERIMENT STATION

Waste Water Analysis (mg per liter)

City/Town Tewksbury

Collecter R. Bursaw

ource A Rocco Landfill - MW - 002 SH
ource B Rocco Landfill - MW - 002 SI
ource C Rocco Landfill - MW - 002 BH
ource D Rocco Landfill - MW - 002 BI

	A	B	C	D	ANALYTICAL METHOD	DATE ANALYZED
Sample No.	95-1936	95-1937	95-1943	95-1944		
Date of Collection	6/28/95	6/28/95	6/28/95	6/28/95		
Time of Collection						
Date Received	6/29/95	6/29/95	6/29/95	6/29/95		
COD		370		22	5220 B*	7/14/95
BOD					5210 B*	
pH					4500H B*	
ALKALINITY TOTAL	1650		72		2320 B*	6/30/95
HARDNESS					SM2340 B	
SUSPENDED SOLIDS					2540 D*	
S..T. SOLIDS ml/l					2540 F*	
TOTAL SOLIDS					2540 B*	
TURBIDITY					EPA 180.1	
SPEC. CONDUCTIVITY, µmhos/cm	3700		185		EPA 120.1	7/5/95
TOTAL KJELDAHL-N					EPA 351.2**	
AMMONIA-N		134		0.04	EPA 350.1	6/29/95
NITRITE-N						
NITRATE-N		0.04		< 0.02	EPA 353.1	6/29/95
TOTAL-P					4500-P E*	
ORTHO-P					4500-P E *	
CHLORIDE	450		10		4500-cl B*	7/6/95
PHENOL					5530 D*	
CYANIDE					4500-CN E*	
SULFATE	60		4.0		EPA 375.4	7/5/95

REMARKS: * Standard Methods, 17th Edition, 1989
** Methods for Chemical Analysis of Water & Waste 1983
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JNL 8-3-95

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
LAWRENCE EXPERIMENT STATION

Waste Water Analysis (mg per liter)

City/Town Tewksbury

Collecter R. Bursaw

Source A Rocco Landfill - MW - 005 H
Source B Rocco Landfill - MW - 005 I
Source C Rocco Landfill - MW - 006 F
Source D Rocco Landfill - MW - 006 G

	A	B	C	D	ANALYTICAL METHOD	DATE ANALYZED
Sample No.	95-1922	95-1923	95-1928	95-1929		
Date of Collection	6/28/95	6/28/95	6/28/95	6/28/95		
Time of Collection						
Date Received	6/29/95	6/29/95	6/29/95	6/29/95		
COD		8100	150		5220 B*	7/14/95
BOD					5210 B*	
pH					4500H B*	
ALKALINITY TOTAL	2300			430	2320 B*	6/30/95
HARDNESS					SM2340 B	
SUSPENDED SOLIDS					2540 D*	
SE... SOLIDS ml/l					2540 F*	
TOTAL SOLIDS					2540 B*	
TURBIDITY					EPA 180.1	
SPEC. CONDUCTIVITY, umhos/cm	6900			1780	EPA 120.1	7/5/95
TOTAL KJELDAHL-N					EPA 351.2**	
AMMONIA-N		125	42		EPA 350.1	6/29/95
NITRITE-N						
NITRATE-N		0.02	0.07		EPA 353.1	6/29/95
TOTAL-P					4500-P E*	
ORTHO-P					4500-P E *	
CHLORIDE	650			380	4500-cl B*	7/6/95
PHENOL					5530 D*	
CYANIDE					4500-CN E*	
SULFATE	< 2.0			8.0	EPA 375.4	7/5/95

REMARKS: * Standard Methods, 17th Edition, 1989
** Methods for Chemical Analysis of Water & Waste 1983
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J.N.A 8-3-95

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
LAWRENCE EXPERIMENT STATION

Waste Water Analysis (mg per liter)

City/Town Tewksbury

Collecter R. Bursaw

ource A Rocco Landfill - MW - 004S H
ource B Rocco Landfill - MW - 004S I
ource C Rocco Landfill - MW - 004B H
ource D Rocco Landfill - MW - 004B I

	A	B	C	D	ANALYTICAL METHOD	DATE ANALYZED
Sample No.	95-1908	95-1909	95-1915	95-1916		
Date of Collection	6/28/95	6/28/95	6/28/95	6/28/95		
Time of Collection						
Date Received	6/29/95	6/29/95	6/29/95	6/29/95		
COD		9300		3200	5220 B*	7/14/95
BOD					5210 B*	
pH					4500H B*	
ALKALINITY TOTAL	2500		1400		2320 B*	6/30/95
HARDNESS					SM2340 B	
SUSPENDED SOLIDS					2540 D*	
SETT. SOLIDS ml/l					2540 F*	
TOTAL SOLIDS					2540 B*	
TURBIDITY					EPA 180.1	
SPEC. CONDUCTIVITY, umhos/cm	7400		4500		EPA 120.1	7/5/95
TOTAL KJELDAHL-N					EPA 351.2**	
AMMONIA-N		204		14	EPA 350.1	6/29/95
NITRITE-N						
NITRATE-N		0.02		< 0.02	EPA 353.1	6/29/95
TOTAL-P					4500-P E*	
ORTHO-P					4500-P E *	
CHLORIDE	650		600		4500-cl B*	7/6/95
PHENOL					5530 D*	
CYANIDE					4500-CN E*	
SULFATE	< 2.0		< 2.0		EPA 375.4	7/5/95

REMARKS: * Standard Methods, 17th Edition, 1989
** Methods for Chemical Analysis of Water & Waste 1983
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JHL
8-3-95

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
LAWRENCE EXPERIMENT STATION

Waste Water Analysis (mg per liter)

City/Town Tewksbury

Collecter R. Bursaw

ource A Rocco Landfill - SW - 1
ource B Rocco Landfill - SW - 1
ource C Rocco Landfill - SW - 2
ource D Rocco Landfill - SW - 2

	A	B	C	D	ANALYTICAL METHOD	DATE ANALYZED
Sample No.	95-1773	95-1774	95-1779	93-1781		
Date of Collection	6/27/95	6/27/95	6/27/95	6/27/95		
Time of Collection						
Date Received	6/28/95	6/28/95	6/28/95	6/28/95		
COD	27		97		5220 B*	7/14/95
BOD					5210 B*	
pH					4500H B*	
ALKALINITY TOTAL		33		240	2320 B*	6/28/95
HARDNESS					SM2340 B	
SUSPENDED SOLIDS					2540 D*	
SETT. SOLIDS ml/l					2540 F*	
TOTAL SOLIDS					2540 B*	
TURBIDITY					EPA 180.1	
SPEC. CONDUCTIVITY, µmhos/cm		374		818	EPA 120.1	6/28/95
TOTAL KJELDAHL-N					EPA 351.2**	
AMMONIA-N	0.12		25		EPA 350.1	6/28/95
NITRITE-N						
NITRATE-N	0.34		0.08		EPA 353.1	6/28/95
TOTAL-P					4500-P E*	
ORTHO-P					4500-P E *	
CHLORIDE		94		118	4500-cl B*	6/28/95
PHENOL					5530 D*	
CYANIDE					4500-CN E*	
SULFATE		22		26	EPA 375.4	6/28/95
DISSOLVED SOLIDS		222		422	SM 2540c	6/28/95

REMARKS: * Standard Methods, 17th Edition, 1989
** Methods for Chemical Analysis of Water & Waste 1983
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JNB 8-3-95

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
LAWRENCE EXPERIMENT STATION

Waste Water Analysis (mg per liter)

City/Town Tewksbury

Collecter R. Bursaw

ource A Rocco Landfill - SW - 3
ource B Rocco Landfill - SW - 3
ource C Rocco Landfill - SW - 4
ource D Rocco Landfill - SW - 4

	A	B	C	D	ANALYTICAL METHOD	DATE ANALYZED
Sample No.	95-1784	95-1787	95-1792	95-1794		
Date of Collection	6/27/95	6/27/95	6/27/95	6/27/95		
Time of Collection						
Date Received	6/28/95	6/28/95	6/28/95	6/28/95		
COD	88			31	5220 B*	7/14/95
BOD					5210 B*	
pH					4500H B*	
ALKALINITY TOTAL		165	165		2320 B*	6/28/95
HARDNESS					SM2340 B	
SUSPENDED SOLIDS					2540 D*	
SED. SOLIDS ml/l					2540 F*	
TOTAL SOLIDS					2540 B*	
TURBIDITY					EPA 180.1	
SPEC. CONDUCTIVITY, umhos/cm		574	577		EPA 120.1	6/28/95
TOTAL KJELDAHL-N					EPA 351.2**	
AMMONIA-N	13			13	EPA 350.1	6/28/95
NITRITE-N						
NITRATE-N	0.06			0.06	EPA 353.1	6/29/95
TOTAL-P					4500-P E*	
ORTHO-P					4500-P E *	
CHLORIDE		88	86		4500-cl B*	6/28/95
PHENOL					5530 D*	
CYANIDE					4500-CN E*	
SULFATE		19	21		EPA 375.4	6/28/95
DISSOLVED SOLIDS		314	318		SM 2540c	6/28/95

REMARKS: * Standard Methods, 17th Edition, 1989
** Methods for Chemical Analysis of Water & Waste 1983
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J.K.L
8-3-95

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

SPECIAL ANALYSIS

CITY/TOWN Tewksbury

COLLECTOR Lapite/Bursaw/Buelow

SOURCE A Rocco Landfill MW 007 H

SOURCE B Rocco Landfill MW 903 G

SOURCE C

Approved JNS

Conc. Units. mg/L

Date 8-7-95

	A	B	C	D	E	F
Sample No.	95-1990	95-1997		Analytical Method	Date Analyzed	MDL
Date of Collection	6/29/95	6/29/95				
Date of Receipt	6/30/95	6/30/95				
Chloride	250	520		SM4500-C1 B	7/6/95	1.0
Sulfate	< 2.0	< 2.0		EPA 375.4	7/5/95	2.0
Alkalinity($CaCO_3$)	850	1700		SM2320 B	6/30/95	1.0
Conductivity(μmhos/cm)	2500	4900		EPA 120.1	7/5/95	

Remarks:

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

SPECIAL ANALYSIS

CITY/TOWN Tewksbury

COLLECTOR Lapite/Bursaw/Buelow

SOURCE A Rocco Landfill MW 007 I

SOURCE B Rocco Landfill MW 903 H

SOURCE C

Approved JKD

Conc. Units. mg/L

Date 7-31-0

	A	B	C	D	E	F
Sample No.	95-1991	95-1998		Analytical Method	Date Analyzed	MDL
Date of Collection	6/29/95	6/29/95				
Date of Receipt	6/30/95	6/30/95				
COD	600	580		SM5220 B	7/14/95	10
Nitrate-N	0.04	0.09		EPA 353.1	6/30/95	0.02

Remarks:

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

SPECIAL ANALYSIS

CITY/TOWN Tewksbury
COLLECTOR Lapite/Bursaw/Buelow

SOURCE A Rocco Landfill MW 003 BH
SOURCE B Rocco Landfill MW 001 SH
SOURCE C Rocco Landfill MW 003 SG

Approved JNL
Date 7-31-95

Conc. Units. mg/L

	A	B	C	D	E	F
Sample No.	95-1970	95-1977	95-1983	Analytical Method	Date Analyzed	MDL
Date of Collection	6/29/95	6/29/95	6/29/95			
Date of Receipt	6/30/95	6/30/95	6/30/95			
COD	88	140	480	SM5220 B	7/14/95	10
Nitrate-N	0.05	0.03	0.09	EPA 353.1	6/30/95	0.02

Remarks:

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M&E Supplemental Evaluation of Rocco Landfill Data Collected October, 1995, and Analyzed and Validated by Wall Experiment Station

Groundwater Samples:

No additional qualifications were necessary. Field duplicate criteria were met.

Surface Water and Sediment Samples

No additional qualifications were necessary. Field duplicate criteria were met. It should be noted that methylene chloride, the only compound detected in the sediment samples, is a common laboratory contaminant.

Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Protection
Senator William X. Wall Experiment Station

William F. Weld
Governor
Trudy S. Coxe
Secretary, EOEA
David B. Struhs
Commissioner

R.C. 12-27-95
File Rocco Landfill
cc: [illegible] FYI
[illegible]
C. Laporte
M. Himmel

MEMORANDUM

TO: Tom Mahin, BWP, DEP-Woburn

FROM: Robert Serabian, Quality Assurance Officer, DEP-WES R.S.

THROUGH: Dr. Oscar C. Pancorbo, Director, DEP-WES OCP

SUBJECT: Rocco Landfill, Tewksbury

DATE: December 18, 1995

Enclosed are the results from the Rocco Landfill, Tewksbury, MA. The samples consisted of ground water and sediment samples to be analyzed for arsenic and volatile organic compounds. The samples were collected on 10/30/95 by Meg Himmel and Mark Gallagher from Metcalf and Eddy, the Department's SARRS contractor, and brought to the Wall Experiment Station for analysis.

- Ground water samples were collected using dedicated disposable Teflon bailers. Sediment samples were collected using grab sampling methods. The sampling events did not require any equipment decontamination.

- The data were validated at the Tier II Level, using the EPA Region I Data Validation Guidelines and the 1992 MSCA QAPP.

- The samples were collected under chain-of-custody.

- The samples were analyzed by the laboratory within EPA-prescribed holding times using the appropriate analytical methods.

- The water sample tested for arsenic had a detectable concentration of this element. Quality control consisted of a sample duplicate, lab fortified matrix (LFM), quality control standard (QCS), and lab fortified matrix (LFM). All quality control results were within their respective acceptance limits.

- Soil and ground water samples tested for VOCs had detectable concentrations of several chlorinated and aromatic volatile compounds. Sediment samples # 95-4176, 95-4178, and 95-4179 had the highest concentrations for any volatile organic compound (methylene chloride). Quality control consisted of a trip blank and surrogate spike recoveries. The trip blank was free of volatile organic analytes. All surrogate spike recoveries were within their respective acceptance limits.

- The correct concentration units were used in generating the final results.

- Any concentration values were adjusted to reflect dilutions, splits, or dry weight factors.

If you want further assistance with data interpretation or analysis, please contact Dr. Oscar C. Pancorbo at (508) 682-5237.

The Wall Experiment Station looks forward to providing analytical expertise to the Bureau of Waste Prevention on future landfill projects. Please feel free to contact us if you have any questions.

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

RCRA METALS

City/Town Tewksbury

Collector M. Himmel

Source A Rocco Landfill MW-001S

Source B

Source C

Matrix: Water

Approved KAH
Date 11-15-95

Conc. Units: mg/L

	A	B	C			
Sample No.	95-4171			**Analytical Method**	**Date Analyzed**	**MDL**
Date of Collection	10/30/95					**mg/L**
Date of Receipt	10/30/95					
Mercury				EPA 7470A		0.0002
Arsenic	0.003			EPA 206.2	11/6/95	0.002
Selenium				EPA 7740		0.002
Barium				EPA 6010A		0.01
Silver				EPA 6010A		0.01
Chromium				EPA 6010A		0.01
Cadmium				EPA 6010A		0.01
Lead				EPA 7421		0.05

REMARKS

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station 1887-1989

QUALITY CONTROL DATA

City/Town: Tewksbury

Collector: M. Himmel

Remarks:

Matrix: Water

Conc. Units: mg/L

SAMPLE ID	ANALYTE	PRECISION			ACCURACY, % RECOVERY			MDL mg/L	METHOD
		Sample	Duplicate	Range	LFB	QCS	LFM		
95-4171	As	0.003	0.004	0.001	108	103	105	0.002	EPA 206.2

Remarks:

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Approved: KAH

Date: 11-15-95

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number 95-4170
Collector Meg Himmel
Received 10/30/95
Source Rocco L. F.
Bottle ID: MW - 003S

City/Town Tewksbury
Collected 10/30/95
Analyzed 11/2/95

RESULTS		MDL*	QUALITY CONTROL		
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
Benzene	7.2	0.28	1,2-dichloroethane-D4	100	86-118
Toluene	0.53	0.30	Fluorobenzene	92	88-110
Chlorobenzene	8.1	0.17	1.4-bromofluorobenzene	103	86-115
Xylenes	7.2	0.40			
Isopropylbenzene	10	0.37			
n-propylbenzene	1.6	0.44			
1.3.5-trimethylbenzene	12	0.43			
1.2.4-trimethylbenzene	1.9	0.43			
1.2-dichlorobenzene	0.79	0.24			
Naphthalene	19	0.29			

*** MDL = Method Detection Limits**

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mas Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which hav a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partitic by purging are detected by this procedure.

**No standard available for verification and quantification. The mass spectrum was compared to a ma spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Alba L. Plebritta
12/5/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-4172	City/Town	Tewksbury
Collector	Meg Himmel	Collected	10/30/95
Received	10/30/95	Analyzed	11/2/95
Source	Rocco L. F.		
Bottle ID:	SW 1		

RESULTS		MDL*	QUALITY CONTROL		
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
Not detected			1,2-dichloroethane-D4	108	86-118
			Fluorobenzene	93	88-110
			1,4-bromofluorobenzene	103	86-115

*** MDL = Method Detection Limits**

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for verification and quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Alice R. Blakesley
12/18/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-4173	City/Town	Tewksbury
Collector	Meg Himmel	Collected	10/30/95
Received	10/30/95	Analyzed	11/2/95
Source	Rocco L. F.		
Bottle ID:	SW 2		

RESULTS		MDL*	QUALITY CONTROL		
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
1.1.1-trichloroethane	3.5	0.33	1,2-dichloroethane-D4	117	86-118
Toluene	15	0.30	Fluorobenzene	96	88-110
Ethylbenzene	1.5	0.31	1.4-bromofluorobenzene	105	86-115
Xylenes	3.5	0.40			
1.2.4-trimethylbenzene	1.1	0.43			
*** MDL = Method Detection Limits**					

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for verification and quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Albert R. Blaney
12/18/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number 95-4174
Collector Meg Himmel
Received 10/30/95
Source Rocco L. F.
Bottle ID: SW 3

City/Town Tewksbury
Collected 10/30/95
Analyzed 11/2/95

RESULTS		MDL*	QUALITY CONTROL		
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
1.1.1-trichloroethane	0.88	0.33	1,2-dichloroethane-D4	112	86-118
Toluene	0.85	0.30	Fluorobenzene	92	88-110
			1,4-bromofluorobenzene	100	86-115

*** MDL = Method Detection Limits**

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for verification and quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Alba R. Gilhooley
12/18/95

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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-4175	City/Town	Tewksbury
Collector	Meg Himmel	Collected	10/30/95
Received	10/30/95	Analyzed	11/2/95
Source	Rocco L. F.		
Bottle ID:	SW 4		

RESULTS		MDL*	QUALITY CONTROL		
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
1,1,1-trichloroethane	0.90	0.33	1,2-dichloroethane-D4	114	86-118
Toluene	0.91	0.30	Fluorobenzene	91	88-110
			1,4-bromofluorobenzene	96	86-115

*** MDL = Method Detection Limits**

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for verification and quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Alba R. Gilbert
12/18/95

p:\jviel\alba\8260.102

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-4176	City/Town	Tewksbury
Collector	Mark Gallagher	Collected	10/30/95
Received	10/30/95	Analyzed	11/7/95
Source	Rocco L. F.		
Bottle ID:	SED - 1		

RESULTS		MDL *	QUALITY CONTROL		
Compounds	ng/g **	ng/g	Surrogate Standards	%Recovery	Acceptance Limits
Methylene chloride	28	2.3	1,2-dichloroethane-D4	82	80-120
			Fluorobenzene	96	81-117
% Dry Solids @ 105°C	77		1,4-bromofluorobenzene	99	74-121

*** MDL = Method Detection Limits**

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

** Results are based on wet weight.

Laboratory Supervisor Gilbert P. Flaherty
12/18/95

p:\jviel\alba\8260.104

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-4177	City/Town	Tewksbury
Collector	Mark Gallagher	Collected	10/30/95
Received	10/30/95	Analyzed	11/7/95
Source	Rocco L. F.		
Bottle ID:	SED - 2		

RESULTS		MDL*	QUALITY CONTROL		
Compounds	ng/g	ng/g	Surrogate Standards	%Recovery	Acceptance Limits
Not detected			1,2-dichloroethane-D4	81	80-120
			Fluorobenzene	87	81-117
% Dry Solids @ 105°C	21		1,4-bromofluorobenzene	80	74-121

*** MDL = Method Detection Limits**

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

Laboratory Supervisor Robert J. Gilbertson
12/18/95

p:\jviel\alba\8260.105

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-4178	City/Town	Tewksbury
Collector	Mark Gallagher	Collected	10/30/95
Received	10/30/95	Analyzed	11/7/95
Source	Rocco L. F.		
Bottle ID:	SED - 3		

RESULTS		MDL *	QUALITY CONTROL		
Compounds	ng/g **	ng/g	Surrogate Standards	%Recovery	Acceptance Limits
Methylene chloride	24	2.3	1,2-dichloroethane-D4	81	80-120
			Fluorobenzene	87	81-117
% Dry Solids @ 105°C	77		1.4-bromofluorobenzene	101	74-121
* MDL = Method Detection Limits					

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

** Results are based on wet weight.

Laboratory Supervisor Albert R. Gilmartin
12/18/95

p:\jviel\alba\8260.106

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-4179	City/Town	Tewksbury
Collector	Mark Gallagher	Collected	10/30/95
Received	10/30/95	Analyzed	11/7/95
Source	Rocco L. F.		
Bottle ID:	SED - 4		

RESULTS		MDL *	QUALITY CONTROL		
Compounds	ng/g **	ng/g	Surrogate Standards	%Recovery	Acceptance Limits
Methylene chloride	36	2.3	1,2-dichloroethane-D4	80	80-120
			Fluorobenzene	86	81-117
% Dry Solids @ 105°C	82		1,4-bromofluorobenzene	88	74-121

*** MDL = Method Detection Limits**

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mas Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which hav a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partitio by purging are detected by this procedure.

** Results are based on wet weight.

Laboratory Supervisor Alice P. Gilchrest
12/18/95

p:\jviel\alba\8260.107

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL ANALYSIS
WILLIAM X. WALL EXPERIMENT STATION
Lawrence Experiment Station: 1887-1989

GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS OF PURGEABLE ORGANICS

Sample Number	95-4180	City/Town	Tewksbury
Collector	Meg Himmel	Collected	10/30/95
Received	10/30/95	Analyzed	11/2/95
Source	Rocco L. F.		
Bottle ID:	Trip Blank		

RESULTS		MDL*	QUALITY CONTROL		
Compounds	µg/L	µg/L	Surrogate Standards	%Recovery	Acceptance Limits
Not detected			1,2-dichloroethane-D4	116	86-118
			Fluorobenzene	92	88-110
			1,4-bromofluorobenzene	109	86-115

*** MDL = Method Detection Limits**

The sample was analyzed according to the EPA procedure, "Method 8260-Gas Chromatography Mass Spectrometry for Volatile Organics, SW-846, 3rd Edition". Only those organic compounds which have a significant vapor pressure in aqueous solution at room temperature and thus are amenable to partition by purging are detected by this procedure.

**No standard available for verification and quantification. The mass spectrum was compared to a mass spectral index and a mass spectral data base for tentative identification.

Laboratory Supervisor Albert R. Silvestro
12/5/95

p:\jviel\alba\8260.103

CHAIN OF CUSTODY FORMS

Case Number: _____

Date of Collection: 10.30.95

Site Name and Location

ROCCO LF
TEWKSBURY, MA

Collected by:

Meg Himmel
Mark Gallagher

Item Number	Sample Description		
	Field Number		Laboratory Number
1 – 2 (40 ml)	MW-203S VOCs	GW	95-4170
2 – (one sample	MW-201S METALS	GW	95-4171
3 –	MW-201S METALS	GW-lab dupl.	95-4171
4 – 2 (40 ml)	SW1 VOCs		95-4172
5 – 2 (40 ml	SW2 VOCs		95-4173
6 – 2 (40 ml)	SW3 VOCs		95-4174
7 – (2 (40 ml	SW4 VOCs		95-4175
8 – 2 (4 oz)	SED 1 VOCs		95-4176
9 – 2 (4 oz)	SED 2 VOCs		95-4177
10 – 2 (4 oz)	SED 3 VOCs		95-4178
11 2 (4 oz)	SED 4 VOCs		95-4179
[redacted]	TRIP BLANK		95-4180

Item Number	Date	Relinquished By	Received By	Purpose of C. of C.
		Printed Name	Printed Name	
	10.30	Meg Himmel	Dennis Brown	
		Signature	Signature	
		MEG HIMMEL	Dennis Brown	Hand del.
		Printed Name	Printed Name	
		Signature	Signature	
		Printed Name	Printed Name	
		Signature	Signature	

FAX # 245.6293
ATTN. MEG HIMMEL

Groundwater, Surface Water, Sediment Analysis Results (Cyanide)

 TOXIKON CORP. REPORT Work Order # 95-06-453

Received: 06/27/95 07/05/95 10:43:42

REPORT TO: METCALF AND EDDY
30 HARVARD MILL SQ
WAKEFIELD, MA 01880
246-5200 FAX:245-6293
ATTEN CONSTANCE LAPITE

PREPARED BY: TOXIKON CORPORATION
225 WILDWOOD AVE
WOBURN, MA 01801
CERTIFIED BY
ATTEN PAUL LEZBERG
PHONE (617)933-6903
CONTACT KIMIE

CLIENT M E WAKE SAMPLES 8
COMPANY METCALF AND EDDY
FACILITY 30 HARVARD MILL SQ
WAKEFIELD, MA 01880

MA CERT # M-MA064: TRACE METALS, SULFATE,CYANIDE,RES. FREE CHLORINE, Ca, TOTAL ALK., TDS, pH, THMs, VOC, PEST.,NUTRIENTS. DEMAND. O&G, PHENOLICS, PCBs . CT DHS #PH-0563, NY #10778 FL HRS E87143, NJ DEP 59538, NC DNR286, SC 88002, NH 204091-C.

WORK ID ROCCO LANDFILL
TAKEN 6/27/95
TRANS
TYPE SOIL AND WATER
P.O. #
INVOICE under separate cover

VERIFIED BY:

SAMPLE IDENTIFICATION	
01	SW-3
02	SW-4
03	SED-3
04	SED-4
05	SW-2
06	SED-2
07	SW-1
08	SED-1

TEST CODES and NAMES used on this workorder

CN TOT CYANIDE TOTAL

SAMPLE ID SW-3 SAMPLE # 01 FRACTIONS: A
Date & Time Collected 06/27/95 11:30:00 Category WATER

CN_TOT 0.0188
mg/L DL=0.01

SAMPLE ID SW-4 SAMPLE # 02 FRACTIONS: A
Date & Time Collected 06/27/95 11:30:00 Category WATER

CN_TOT 0.0260
mg/L DL=0.01

SAMPLE ID SED-3 SAMPLE # 03 FRACTIONS: A
Date & Time Collected 06/27/95 12:00:00 Category SOIL

CN_TOT 1.40
mg/Kg DL=0.7

SAMPLE ID SED-4 SAMPLE # 04 FRACTIONS: A
Date & Time Collected 06/27/95 12:00:00 Category SOIL

CN_TOT ND
mg/Kg DL=0.7

SAMPLE ID SW-2 SAMPLE # 05 FRACTIONS: A
Date & Time Collected 06/27/95 13:30:00 Category WATER

CN_TOT ND
mg/L DL=0.01

SAMPLE ID SED-2 SAMPLE # 06 FRACTIONS: A
Date & Time Collected 06/27/95 13:45:00 Category SOIL

CN_TOT ND
mg/Kg DL=0.7

SAMPLE ID SW-1 SAMPLE # 07 FRACTIONS: A
Date & Time Collected 06/27/95 14:45:00 Category WATER

CN_TOT 0.0170
mg/L DL=0.01

SAMPLE ID SED-1 SAMPLE # 08 FRACTIONS: A
Date & Time Collected 06/27/95 15:00:00 Category SOIL

CN_TOT ND
mg/Kg DL=0.7

TEST CODE CN TOT NAME CYANIDE TOTAL

EPA METHOD: 335.3 for water sample

Reference: Methods for Chemical Analysis of Water and Wastes.
EPA 600/4-79-020 (Revised, March 1983). EPA/EMSL.

EPA METHOD: 9010 for soil sample

Reference: Methods for Evaluating Solid Waste: Physical/Chemical Methods.
EPA SW-846 (Third Edition) 1986. Office of Solid Waste, USEPA.

Page 1 TOXIKON CORP. REPORT Work Order # 95-06-481
Received: 06/29/95 07/07/95 11:51:30

REPORT METCALF AND EDDY
TO 30 HARVARD MILL SQ
WAKEFIELD, MA 01880
246-5200 FAX:245-6293
ATTEN C.LAPITE/K.BURSWA/B.BUELOW

PREPARED TOXIKON CORPORATION
BY 225 WILDWOOD AVE
WOBURN, MA 01801
CERTIFIED BY
ATTEN PAUL LEZBERG
PHONE (617)933-6903 CONTACT KIMIE

CLIENT M E WAKE SAMPLES 6
COMPANY METCALF AND EDDY
FACILITY 30 HARVARD MILL SQ
WAKEFIELD, MA 01880

MA CERT # M-MA064: TRACE METALS, SULFATE,CYANIDE,RES. FREE CHLORINE, Ca, TOTAL ALK., TDS, pH, THMs, VOC, PEST.,NUTRIENTS. DEMAND, O&G, PHENOLICS, PCBs . CT DHS #PH-0563, NY #10778 FL HRS E87143, NJ DEP 59538, NC DNR286, SC 88002, NH 204091-C.

WORK ID ROCCO LANDFILL 017692-0003
TAKEN 6/28/95
TRANS
TYPE WATER
P.O. #
INVOICE under separate cover

VERIFIED BY:

SAMPLE IDENTIFICATION	TEST CODES and NAMES used on this workorder
01 MW-004SF	CN TOT CYANIDE TOTAL
02 MW-004BF	
03 MW-002SF	
04 MW-002BF	
05 MW-005F	
06 MW-006I	

SAMPLE ID MW-004SF SAMPLE # 01 FRACTIONS: A
Date & Time Collected 06/28/95 11:45:00 Category WATER

CN_TOT ND
mg/L DL=0.01

SAMPLE ID MW-004BF SAMPLE # 02 FRACTIONS: A
Date & Time Collected 06/28/95 12:15:00 Category WATER

CN_TOT ND
mg/L DL=0.01

SAMPLE ID MW-002SF SAMPLE # 03 FRACTIONS: A
Date & Time Collected 06/28/95 15:45:00 Category WATER

CN_TOT ND
mg/L DL=0.01

SAMPLE ID MW-002BF SAMPLE # 04 FRACTIONS: A
Date & Time Collected 06/28/95 17:15:00 Category WATER

CN_TOT ND
mg/L DL=0.01

SAMPLE ID MW-005F SAMPLE # 05 FRACTIONS: A
Date & Time Collected 06/28/95 11:45:00 Category WATER

CN_TOT ND
mg/L DL=0.01

SAMPLE ID MW-006I SAMPLE # 06 FRACTIONS: A
Date & Time Collected 06/28/95 15:40:00 Category WATER

CN_TOT ND
mg/L DL=0.01

TEST CODE CN_TOT NAME CYANIDE TOTAL

EPA METHOD: 335.3 for water sample

Reference: Methods for Chemical Analysis of Water and Wastes.
EPA 600/4-79-020 (Revised, March 1983). EPA/EMSL.

EPA METHOD: 9010 for soil sample

Reference: Methods for Evaluating Solid Waste: Physical/Chemical Methods.
EPA SW-846 (Third Edition) 1986. Office of Solid Waste, USEPA.

 TOXIKON CORP. REPORT Work Order # 95-06-495

Received: 06/29/95 07/07/95 11:51:59

REPORT METCALF AND EDDY
TO 30 HARVARD MILL SQ
WAKEFIELD, MA 01880
246-5200 FAX:245-6293
ATTEN CONSTANCE LAPITE

PREPARED TOXIKON CORPORATION
BY 225 WILDWOOD AVE
WOBURN, MA 01801
CERTIFIED BY
ATTEN PAUL LEZBERG
PHONE (617)933-6903 CONTACT KIMIE

CLIENT M E WAKE SAMPLES 5
COMPANY METCALF AND EDDY
FACILITY 30 HARVARD MILL SQ
WAKEFIELD, MA 01880

MA CERT # M-MA064: TRACE METALS, SULFATE,CYANIDE,RES. FREE CHLORINE, Ca, TOTAL ALK., TDS, pH, THMs, VOC, PEST.,NUTRIENTS. DEMAND. O&G, PHENOLICS, PCBs . CT DHS #PH-0563, NY #10778 FL HRS E87143, NJ DEP 59538, NC DNR286, SC 88002, NH 204091-C.

WORK ID ROCCO LANDFILL
TAKEN 6/29/95
TRANS
TYPE WATER
P.O. #
INVOICE under separate cover

VERIFIED BY:

SAMPLE IDENTIFICATION

01 MW-003B
02 MW-003S
03 MW-001S
04 MW-007
05 MW-903

TEST CODES and NAMES used on this workorder

CN TOT CYANIDE TOTAL

SAMPLE ID MW-005B SAMPLE # 01 FRACTIONS: A
Date & Time Collected 06/29/95 13:30:00 Category WATER

CN_TOT ND
mg/L DL=0.01

SAMPLE ID MW-003S SAMPLE # 02 FRACTIONS: A
Date & Time Collected 06/29/95 10:03:00 Category WATER

CN_TOT ND
mg/L DL=0.01

SAMPLE ID MW-001S SAMPLE # 03 FRACTIONS: A
Date & Time Collected 06/29/95 11:45:00 Category WATER

CN_TOT ND
mg/L DL=0.01

SAMPLE ID MW-007 SAMPLE # 04 FRACTIONS: A
Date & Time Collected 06/29/95 14:03:00 Category WATER

CN_TOT ND
mg/L DL=0.01

SAMPLE ID MW-903 SAMPLE # 05 FRACTIONS: A
Date & Time Collected 06/29/95 10:06:00 Category WATER

CN_TOT ND
mg/L DL=0.01

TEST CODE CN TOT NAME CYANIDE TOTAL

EPA METHOD: 335.3 for water sample

Reference: Methods for Chemical Analysis of Water and Wastes.
EPA 600/4-79-020 (Revised, March 1983). EPA/EMSL.

EPA METHOD: 9010 for soil sample

Reference: Methods for Evaluating Solid Waste: Physical/Chemical Methods.
EPA SW-846 (Third Edition) 1986. Office of Solid Waste, USEPA.

REGION I
Data Review Worksheet

Site Name: Rocco Landfill
Reference Number:

REGION I REVIEW OF INORGANIC CONTRACT LABORATORY DATA PACKAGE

The hard-copied (laboratory name) Toxikon data package received at Region I has been reviewed and the quality assurance and performance data summarized. The data review included:

Case No(s)	9576495 481 ~~483~~	SAS No.	___	Sampling Date(s)	6/27/95; 6/28/95; 6
SDG No.	___	Matrix	___	Shipping Date(s)	_____
No. of Samples	___			Date Rec'd by Lab	_____

Traffic Report Nos.: SW-1; SW-2; SW-3; SW-4; SED-1; SED-2; SED-3; SED-4; MW-004B; MW-002S; MW-[illegible]; MW-006; MW-002B; *
Equipment Blank No.: None
Field Dup Nos.: SW-3, SW-4; SED-3, SED-4, MW-002S, MW-905

SOW No. _____ requires that specific analytical work be done and that associated reports be provided by the laboratory to the Regions, EMSL-LV, and SMO. The general criteria used to determine the performance were based on an examination of:

- Data Completeness
- Holding Times
- Calibrations
- Blanks
- ICP Interference Check Results
- Matrix Spike Recoveries
- Laboratory Duplicates
- Field Duplicates
- Lab Control Sample Results
- Furnace AA Results
- ICP Serial Dilution Results
- Detection Limit Results
- Sample Quantitation

Overall comments_____

Definitions and Qualifiers:

A - Acceptable data
J - Approximate data due to quality control criteria
R - Reject data due to quality control criteria
U - Analyte not detected

Reviewer: Barbara Lynch Date: 6/11/96

* MW-004B; MW-003B; MW-003S; MW-001S; MW-007; MW-905

Region I
Data Review Worksheets

II. HOLDING TIMES Complete table for all samples and circle the fractions which are not within criteria.

	Sample ID	Date Sampled	HG Date Analysis	Cyanide Date Analysis	Others Date Analysis	pH	Action
1553	SW-4	6/27/95	NA	7/3/95			
	SW-3						
	SED-3						
	SED-4						
	SW-2						
	SED-2						
	SW-1						
	SED-1						
1481	MW-004S	6/28/95	NA	7/6/95			
	MW-004B						
	MW-002S						
	MW-002B						
	MW-005						
	MW-006						
1495	MW-003B	6/29/95	NA	7/6/95			
	MW-005S						
	MW-001S						
	MW-007						
	MW-903						

METALS: 180 Days from Sample Collection
MERCURY; 28 Days from Sample Collection
CYANIDE: 14 Days from Sample Collection

Action: 1. If holding times are exceeded, all positive results are estimated (J) and non-detects are estimated (UJ).

2. If holding times are grossly exceeded, the reviewer may determine that non-detects as unusable(R).

REGION I
Data Review Worksheets

VI. BLANK ANALYSIS RESULTS (Sections 1 - 3)

List the blank contamination in Sections 1 and 2 below. A separate worksheet should be used for soil and water blanks.

1. Laboratory Blanks Units:_____ Matrix: Aqueous

Analyte	ICB	CCB1	CCB2	CCB3	CCB4	PREP BLK
for work orders 95-06495						Lab reports all BDL
95-06-453 (Aq + Soil)						
95-06-481						

2. Equipment Blanks

Sample# _____ Sample# _____

Analyte	Conc./Units	Analyte	Conc./Units
None was collected			

REGION I
Data Review Worksheets

VI. BLANK ANALYSIS RESULTS (Continued)

3. Frequency Requirements

   A. Was a preparation blank analyzed for each matrix, for every 20 samples and for each digestion batch? (Yes) or No

   B. Was a calibration blank run every 10 samples or every 2 hours whichever is more frequent? (Yes) or No.

As well as can be determined from the runlogs provided, these criteria were met.

If No,

The data may be affected. Use professional judgement to determine the severity of the effect and qualify the data accordingly. Discuss any actions below, and list the samples affected.

_____

_____

_____

REGION I
Data Review Worksheets

4. Blank Actions

The Action Levels for any analyte is equal to five times the highest concentration of that element's contamination in any blank. The action level for samples which have been concentrated or diluted should be multiplied by the concentration/dilution factor. No positive sample result should be reported unless the concentration of the analyte in the result exceeds the Action Level (AL). Specific actions are as follows:

When the concentration is greater than the IDL, but less than the Action Level, report the sample concentration detected with a U.

When the sample concentration is greater than the Action Level, report the sample concentration unqualified.

MATRIX: Aq

ELEMENT	MAX. CONC./ UNITS	AL/ UNITS
CN	no action	

MATRIX: Soil

ELEMENT	MAX. CONC./ UNITS	AL/ UNITS
CN	no action	

NOTE: Blanks analyzed during a soil case must be converted to mg/kg in order to compare them with the sample results.

$$\text{Conc. in ug/L} \times \frac{\text{Volume diluted to (200 ml)}}{\text{Weight Digested (1 gram)}} \times \frac{1\text{L}}{1000\text{ ml}} \times \frac{1000\text{ gm}}{1\text{kg}} \times \frac{1\text{mg}}{1000\text{ ug}} = \frac{\text{mg}}{\text{kg}}$$

Multiplying this result by 5 to arrive at the action level gives a final result which can then be compared to sample results.

Region I
Data Review Worksheets

VI. Matrix Spike Recoveries

TR# _____ Matrix: Ag ; Soil
6

Recovery Criteria

List the percent recoveries for analytes which did not meet the required criteria.

S - amount of spike added
SSR - spikes sample result
SR - sample result

Analyte	SSR	SR	S	%R	ACTION
Cyanide	Matrix Spike results met for all criteria for all three cases and both matrices.				

Matrix Spike Actions apply to all samples of the same matrix.

Actions:

1. If the sample concentration exceeds the spike concentration by a factor of 4 or more, no action is taken.
2. If any analyte does not meet the %R criteria, follow the actions stated below.

	PERCENT RECOVERY		
	30%	30%-74%	>125%
Positive Sample Results	J	J	J
Non-detected Results	R	UJ	A

Frequency Criteria

A. Was a matrix spike prepared at the required frequency? (Yes) or No
B. Was a post digestion spike analyzed for elements that did not meet required criteria for matrix spike recovery? Yes or No Not Applicable

A separate worksheet should be used for each matrix spike pair.

Region I
Data Review Worksheets

VII. LABORATORY DUPLICATES

List the concentrations of any analyte not meeting the criteria for duplicate precision. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criteria was used to evaluate the precision by circling either the RPD or CRDL for each element.

Matrix: Aq / Soil

Element	CRDL		Sample #	Duplicate #	RPD	Action
	Water ug/L	Soil mg/kg				
Aluminum	200					
Antimony	60					
Arsenic	10					
Barium	200					
Beryllium	5					
Cadmium	5					
Calcium	5000					
Chromium	10					
Cobalt	50					
Copper	25					
Iron	100					
Lead	5					
Magnesium	5000					
Manganese	15					
Mercury	0.2					
Nickel	40					
Potassium	5000					
Selenium	5					
Silver	10					
Sodium	10					
Thallium	10					
Vanadium	50					
Zinc	20					
Cyanide	10	All Duplicate % RSD < 10%				

Laboratory Duplicate Actions should be applied to all other samples of the same matrix type.

Actions:

1. Estimate (J) positive results for elements which have an RPD >20% for waters and >35% for soils.
2. If sample results are less than 5X the CRDL, estimate (J) positive results for elements whose absolute difference is >CRDL, (2XCRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

Region I
Data Review Worksheets

VIII. FIELD DUPLICATES

List the concentrations of all analytes in the field duplicate pair. For soil duplicates, calculate the CRDL in mg/kg using the sample weight, volume and percent solids data for the sample. Indicate what criterion was used to evaluate the precision by circling either RPD or CRDL for each element.

Matrix: Aq → GW both ND; SW see below; SED-Se below

Element	CRDL		Sample #	Duplicate #	RPD	Action
	Water ug/L	Soil mg/kg				
Aluminum	200					
Antimony	60					
Arsenic	10					
Barium	200					
Beryllium	5					
Cadmium	5					
Calcium	5000					
Chromium	10					
Cobalt	50					
Copper	25					
Iron	100					
Lead	5					
Magnesium	5000					
Manganese	15					
Mercury	0.2					
Nickel	40					
Potassium	5000					
Selenium	5					
Silver	10					
Sodium	5000					
Thallium	10					
Vanadium	50					
Zinc	20					
Cyanide	0.01 ~~10~~		0.0155	0.0260	32%	No action
SED Cyanide	0	0.7	1.40 J	ND	—	Estimate both

Field Duplicate Actions should be applied to all other samples of the same matrix type.

Actions:

1. Estimate (J) positive results for elements which have an RPD >30% for waters and >50% for soils.
2. If sample results are less than 5X the CRDL, estimate (J) positive results for elements whose absolute difference is >2xCRDL, (4XCRDL for soils). If both samples are non-detected, the RPD is not calculated (NC).

SED CN is detected in one sample; ND in Duplicate. Estimate both (J, UJ)

SW DL = 0.01, both < 5x CRDL but |0.0155 − 0.0260| < 2xCRDL; 0.0012 < 0.02; no action nec.

TOXIKON

15 Wiggins Ave., Bedford, MA 01730
Telephone: (617) 275-3330
Fax: (617) 271-1136

FACSIMILE INSTRUCTION SHEET

Date: _____

Name: Constance Lapite

Company: M&E

Fax #: 245-6293 ~~275-3~~

From: D. Skelly

Total No. of Pages Including Cover Sheet: 14

If you do not receive all of the pages, please call (617) 275-3330. Thank you. Notes:

QC reports You requested

Doug Skelly

STATEMENT OF CONFIDENTIALITY

CONFORMANCE/NON-CONFORMANCE SUMMARY

Work Order #: 9506495

I certify that the reported laboratory results were prepared under my direction or supervision in accordance with a system designed to assure qualified personnel evaluate the information submitted. I certify that the information submitted is true, accurate, and complete to the best of my knowledge and belief. The analyses were conducted without deviation from accepted practices, and were reviewed by the Quality Assurance Department.

Douglas V. Sheeley
Laboratory Manager

7/7/95
Date

CASE NARRATIVE

Work Ord: 9506495

All samples were analyzed within the method holding times.

No target compounds were detected in the method blanks.

LABORATORY CHRONICLE

All samples were chilled to 4°C at the time of receipt at Toxikon.

Toxikon Work Order #: 9506495

Date of Sample Collection: 6/29/95

Sample ID: As per chain of Custody

ANALYSIS:

TCN:

prep	7/5/95
analysis	7/6/95

Holding times were met for all sample analyses.

TOXIKON PROJECT # 9506495

QC SUMMARY-CN
MATRIX-WATER

ICV %REC	MS %REC	CS %REC	DUPLICATE %RPD	CCV %REC
104	82	85	8.3	102

Method Blank=BDL

ACCEPTANCE CRITERIA

ICV %REC	MS %REC	CS %REC	DUPLICATE %RPD	CCV %REC
90-110%	80-120%	80-120%	<25% RPD	90-110%

CASE NARRATIVE

Work Ord: 9506481

All samples were analyzed within the method holding times.

No target compounds were detected in the method blanks.

CONFORMANCE/NON-CONFORMANCE SUMMARY

Work Order #: 9506481

I certify that the reported laboratory results were prepared under my direction or supervision in accordance with a system designed to assure qualified personnel evaluate the information submitted. I certify that the information submitted is true, accurate, and complete to the best of my knowledge and belief. The analyses were conducted without deviation from accepted practices, and were reviewed by the Quality Assurance Department.

Douglas V. Sheeley
Laboratory Manager

7/7/95
Date

LABORATORY CHRONICLE

All samples were chilled to 4°C at the time of receipt at Toxikon.

Toxikon Work Order #: 9506481

Date of Sample Collection: 6/28/95

Sample ID: As per chain of Custody

ANALYSIS:

TCN:

prep	7/5/95
analysis	7/6/95

Holding times were met for all sample analyses.

TOXIKON PROJECT # 9506481

QC SUMMARY-CN
MATRIX-WATER

ICV %REC	MS %REC	CS %REC	DUPLICATE %RPD	CCV %REC
104	82	85	8.3	102

Method Blank=BDL

ACCEPTANCE CRITERIA

ICV %REC	MS %REC	CS %REC	DUPLICATE %RPD	CCV %REC
90-110%	80-120%	80-120%	<25% RPD	90-110%

CASE NARRATIVE

Work Ord: 9506453

All samples were analyzed within the method holding times.

No target compounds were detected in the method blanks.

CONFORMANCE/NON-CONFORMANCE SUMMARY

Work Order #: 9506453

I certify that the reported laboratory results were prepared under my direction or supervision in accordance with a system designed to assure qualified personnel evaluate the information submitted. I certify that the information submitted is true, accurate, and complete to the best of my knowledge and belief. The analyses were conducted without deviation from accepted practices, and were reviewed by the Quality Assurance Department.

Douglas V. Sheeley

Douglas V. Sheeley
Laboratory Manager

7/5/95

Date

LABORATORY CHRONICLE

All samples were chilled to 4°C at the time of receipt at Toxikon.

Toxikon Work Order #: 9506453

Date of Sample Collection: 6/27/95

Sample ID: As per chain of Custody

ANALYSIS:

TCN:

prep	6/30/95
analysis	7/3/95

Holding times were met for all sample analyses.

TOXIKON PROJECT # 9506453

QC SUMMARY-CN
MATRIX-WATER

ICV %REC	MS %REC	CS %REC	DUPLICATE %RPD	CCV %REC
104	82	85	8.3	102

Method Blank=BDL

ACCEPTANCE CRITERIA

ICV %REC	MS %REC	CS %REC	DUPLICATE %RPD	CCV %REC
90-110%	80-120%	80-120%	<25% RPD	90-110%

TOXIKON PROJECT # 9506453

QC SUMMARY-CN
MATRIX-SOIL

ICV %REC	MS %REC	CS %REC	DUPLICATE %RPD	CCV %REC
104	92	85	0	102

Method Blank=BDL

ACCEPTANCE CRITERIA

ICV %REC	MS %REC	CS %REC	DUPLICATE %RPD	CCV %REC
90-110%	80-120%	80-120%	<25% RPD	90-110%

TOXIKON

15 Wiggins Ave., Bedford, MA 01730
Telephone: (617) 275-3330
Fax: (617) 271-1136

FACSIMILE INSTRUCTION SHEET

Date: 6/18

Name: Constance Lapite

Company: MEE

Fax #: 245 6293

From: Doug Sheeley

Total No. of Pages Including Cover Sheet: 5

If you do not receive all of the pages, please call (617) 275-3330. Thank you. Notes:

Logbook pages you requested

Sorry it took so long - 95 logbooks were stored off-site.

STATEMENT OF CONFIDENTIALITY

SAMPLE PREPARATION SHEET

BQC#: _____ Project #: _____ Analysis: T-CN

Method #: _____

	Sample ID #	Sample Used (ml or g)	Reagent #1 _____ ( )	Reagent #2 _____ ( )	Reagent #3 _____ ( )	Reagent #4 _____ ( )	Reagent #5 _____ ( )	Final Vol.(ml)	Prep. By/On
	6415.12	250ml							6/24 AB
	.13	↓							
	6421.4	↓							6/30 AB
	6471.63	↓							
W	6453.1	250ml							
W	.2	↓						Dry weight 72.1 %	
S	6453.3	10.018						72.1 %	
S	DUP	9.869						79.9 %	
S	6453.4	8.638							
W	6453.5	250ml						45.6 %	
S	6453.6	6.284							
W	6453.7	250ml						44.2 %	
S	6453.8	8.264							

Comments:

SPECTROPHOTOMETRIC DATA SHEET

BQC#: 9506214 Project #: see sample # sample prep 6/29/95
Analysis: T-Cyanides Method #: 335.3
Instrument: Perkin Elmer Analyzed By/On: AS 6/30/95 DL= 0.01 mg/L 0.7 mg/kg
Standard ID#: 950620wc Original Data In: Sample prep, 6/29/95
Reagents: 1. LPR 950617 2. LPR 950618
3. ~~LPR 400005~~ As 4.
QC Information: RS 9504005 IV = 0.77 mg/L CS mg = 0.2 mg/L
y = mx + B x = 0.588875 B = 0.004107 R = 0.9974

Sample ID #	Sample Volume (ml)	Dilution	Instrument Response 578	Analytical Result (mg/L)	Comments mg/kg
0.3	25		0.573	NA	
0.2			0.318		
0.1			0.158		
0.01			0.012		
0.00			0.000		
ICV		1:5	0.266	0.804	104 %
MB			0.000	ND	
CS MS			0.138	0.085	85 %
MS 6415.1			0.140	0.087	92 %
6415.1 6415.2			0.001	ND	
6415.2 Dup			~~0.025~~ 0.036	0.025	RPD = 8.3 %
Dup .3			~~0.023~~ 0.032	0.023	
.3 .4			0.035	0.027	
.4 .5			0.038	0.026	
.5 X .6			0.007	ND	
CCV CCV 7		1:5	0.266	0.804	104 %
.6 .8			0.007	ND	
.7 .9			0.006	ND	
.8 .10			0.011	0.011	
.9 Dup			0.011	0.011	
.10 MB 11			0.013	0.014	RPD = 0 %
MB .12			0.000	ND	
CS .11			0.138	0.085	
Dup 6415.10 Dup			0.016	0.014	
MB			0.000	ND	
CCV CCV		1:5	0.260	~~0.804~~ 0.786	102 %
.11 6415.11			0.022	0.017	
.12 .12			0.012	0.011	
.13 .13			0.014	0.012	
6421.5			0.017	0.014	
6471.5			0.004	ND	
6453.1			0.025	0.0188	
.2			0.026	0.026	
Soil MS 6453.3			~~cloudy 0.076~~ 0.042	0.134	~~42 %~~ 92 %
Dup 6453.3			cloudy 0.063	0.041	~~RPD = 1.4 mg/kg~~ RPD =
CCV CCV		1:5	0.260	0.786	102 %
Dup			0.062		1.4 mg/L
Soil 6453.4			0.002	~~ND~~ AS	ND
.5			0.003	ND	
Soil .6			0.002		ND
.7			0.002	0.017	
Soil .8			0.006		ND
CCV	V	1:5	0.260	0.786	102 %

07/03/95

SAMPLE PREPARATION SHEET

BQC#: _____ Project #: _____ Analysis: T-Cyanides

Method #: EPA 335.3 CS, MS = 0.2 mg/L

Sample ID #	Sample Used (ml or g)	Reagent #1 DI water (ml)	Reagent #2 1.25 N NaOH (ml) LPR 9507006	Reagent #3 $MgCl_2$ (ml) LPR 9505045	Reagent #4 H_2SO_4 conc (ml) ESE 9501005	Reagent #5 _____ ( )	Final Vol. (ml)	Prep. By/On
ICV	250	—	50	10	20			AS 7/5/95
MB	—	250						
CS	~~250~~ AS	250						
MS	250	"						
6481.1		"						
Dup		"						
.2		"						
.3		"						
.4		"						
.5		"						
CCV		"						
.6		"						
6495.1		"						
.2		"						AS 7/6/95
.3	250	"						
.4		"						
.5		"						

Comments:

SPECTROPHOTOMETRIC DATA SHEET

BQC#: 9507022 wa Project #: see sample ID
Analysis: T-Cyanides Method #: 335.3
Instrument: Perkin Elmer Analyzed By/On: AS 7/6/95 DL= 0.01 mg/L
Standard ID#: ws9507002wc Original Data In: 0.7 mg/L
Reagents: 1. LPR9506017 2.
3. LPR9506018 4.
QC Information: RS 9504005wc TV = 0.77 mg/L
R^2 = 0.998552 K = -0.00499 Y = 0.527326

Sample ID #	Sample Volume (mL)	Dilution	Instrument Response	Analytical Result (mg/L)	Comments
0.3	25		0.580	ND	
0.2			0.402		
0.1			0.196		
0.01			0.040		
0.00			0.000		
ICV		5.0	0.256	0.642	
MB			0.00	ND	
CS			0.225	0.112	
MS			0.226	0.116	
6481.1			0.003	ND	
Dup			0.002	ND	
.2			0.003	ND	
.3			0.004	ND	
.4			0.006	ND	
.5			0.005	ND	
.6			0.004	ND	
6495.1			0.006	ND	
.2			0.007	ND	
.3			0.004	ND	
.4			0.006	ND	
Dup			0.007	ND	R
.5			0.011	ND	
CCV		5.0	0.255	0.642	

AS 7/6/95

SPECTROPHOTOMETRIC DATA SHEET

BQC#: 9507022 wa Project #: see sample ID
Analysis: T-Cyanides Method #: 335.3
Instrument: Perkin Elmer Analyzed By/On: AB 7/6/95 DL= 0.01 mg/l
Standard ID#: ws 9504002 wc Original Data In: 0.7 mg/l
Reagents: 1. LPR 9506017 2.
3. LPR 9506018 4.
QC Information: Rs 9504005 wc Tv = 0.77 mg/l
R^2 = 0.998552 K = -0.00449 x = 0.521326

Sample ID #	Sample Volume (ml)	Dilution	Instrument Response	Analytical Result (mg/L)	Comments
0.3	25		0.580	NA	
0.2			0.402		
0.1			0.196		
0.01			0.040		
0.00			0.000		
ICV		5.0	0.256	0.642	
MB			0.00	ND	
CS			0.225	0.112	
MS			0.226	0.116	
6481.1			0.003	ND	
Dup			0.002	ND	
.2			0.003	ND	
.3			0.004	ND	
.4			0.006	ND	
.5			0.005	ND	
.6			0.004	ND	
6495.1			0.006	ND	
.2			0.007	ND	
.3			0.006	ND	
.4			0.006	ND	
Dup			0.007	ND	
.5			0.011	ND	
CCV		5.0	0.256	0.642	

AB 7/6/95